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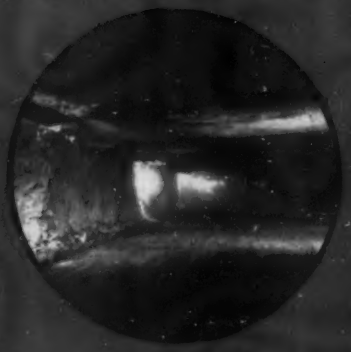

In this issue

White Pine Mine Development

Page 34

EIMCO

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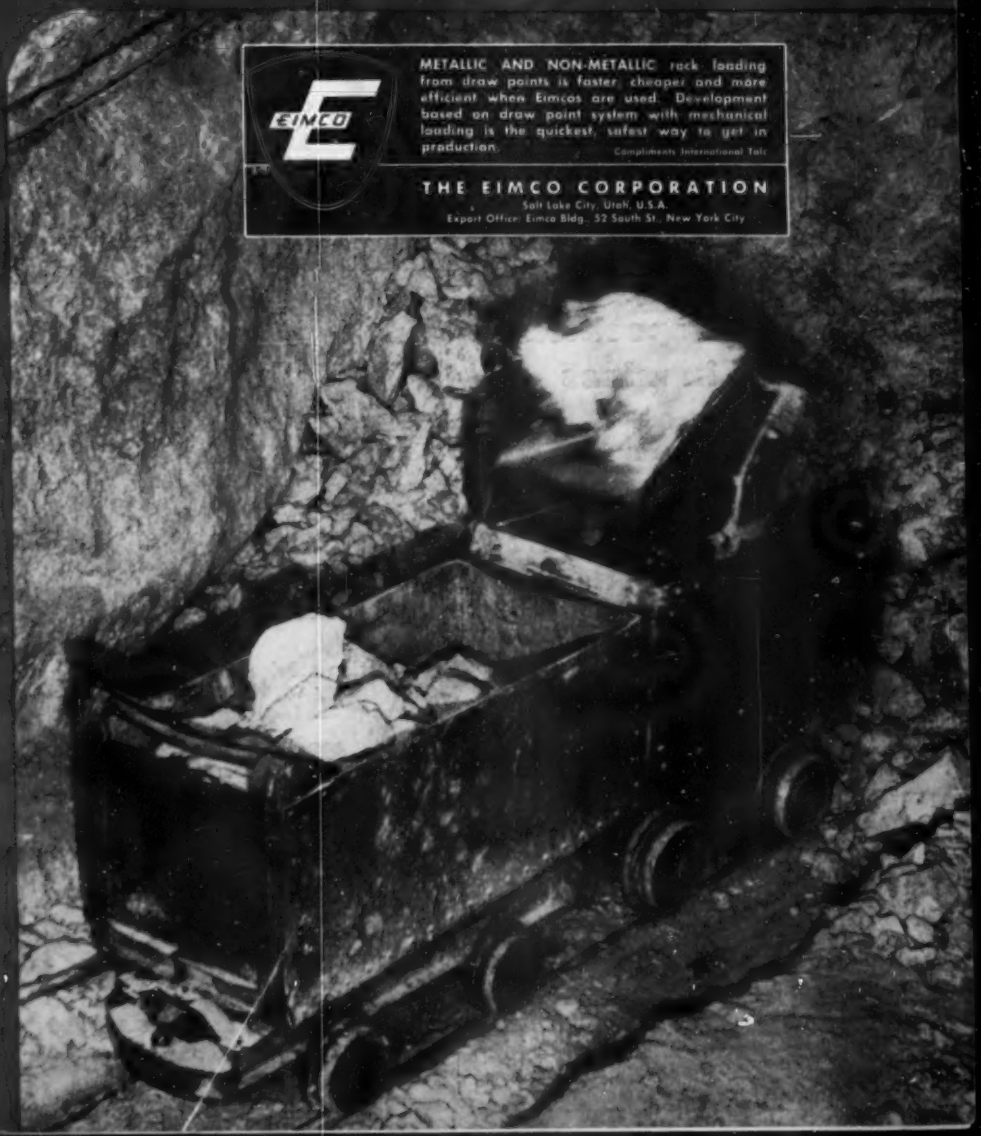

APRIL, 1954

Vol. 15 No. 4

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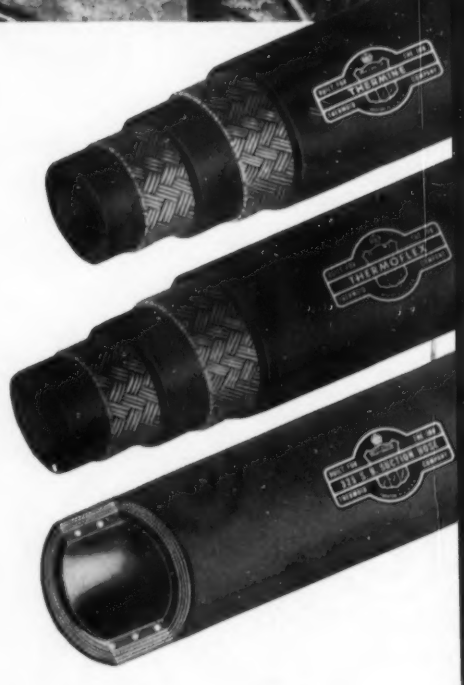

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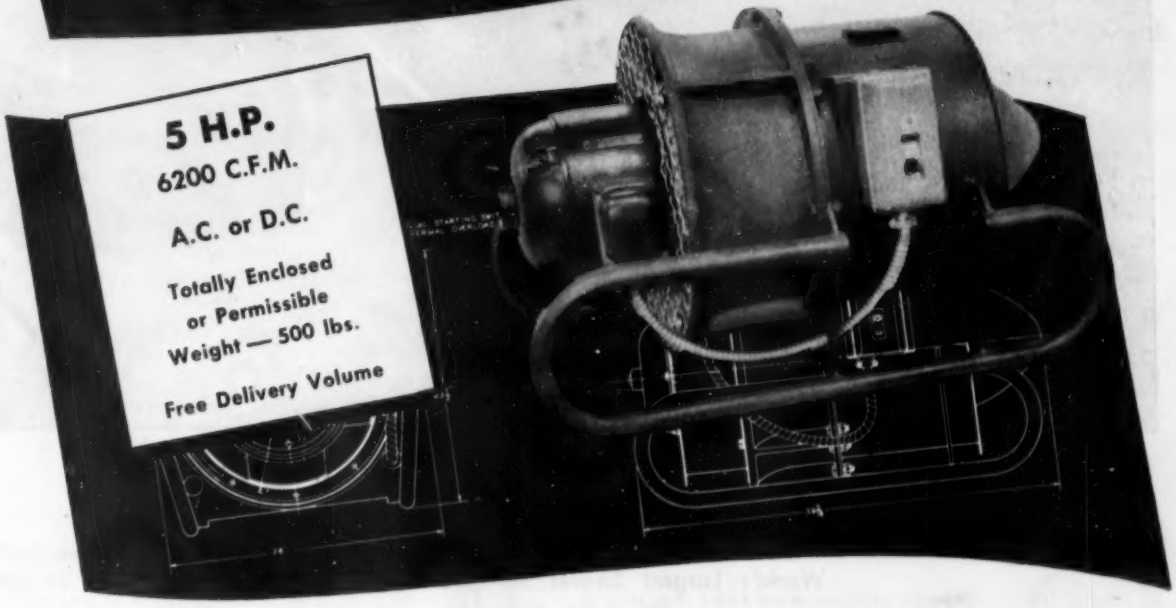

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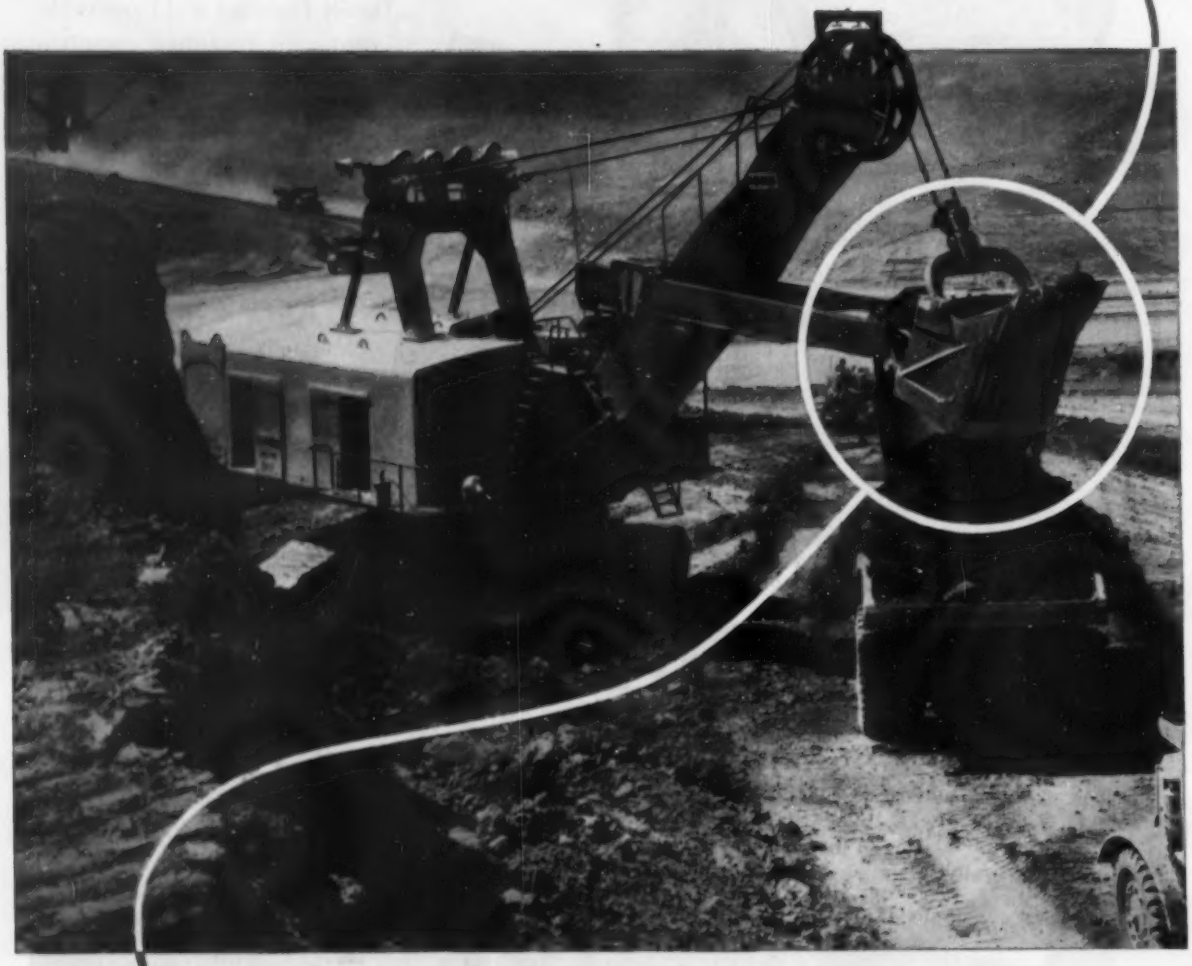

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10 Cubic Yards
with small machine cycle speed and maneuverability
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MARION ESPECIALLY INVITES YOU to attend the Metal Mining Convention in Seattle this month—we want to tell you about production records the new MARION 191-M is setting in copper and iron.

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Offices and warehouses in all principal cities

SYDVARANGER SAMPLES

Personal Interest In Story

Dear Sir:

The article on the operations of Sydvaranger is most interesting. Since we had some contact with their men when they were in this country a year or two ago and had discussed our flowsheet, equipment, etc., with them and permitted one of their men to go through our Babbitt plant, then just starting in operation, we have a kind of personal interest in the story.

Congratulations to Mining World for such an excellent piece of work.

C. L. Kingsbury
Vice President,
Reserve Mining Company
Cleveland, Ohio.

Timely Report

Dear Sir:

I feel that Mining World did a fine job in getting first hand information on the "Sydvaranger Story." It is an up-to-date report which is very timely.

L. J. Severson
Vice President,
Oliver Iron Mining Division
Duluth, Minnesota.

Experience Useful

Dear Sir:

I read with a great deal of interest your excellent article covering the Norway taconite operations. I am sure their experience will be very helpful to the people now engaged in developing taconite properties in the Lake Superior District.

R. C. Fish
General Manager,
M. A. Hanna Company
Cleveland, Ohio.

Interesting and Timely

Dear Sir:

I have found the October 1953 Sydvaranger Taconite Issue very interesting and certainly it is timely in view of the large taconite program in this country.

The information in this article will make a ready reference of desirable data.

C. C. Henning
General Manager of Ore Mines
and Quarries
Jones & Laughlin Steel Corp.
Pittsburgh, Pennsylvania.

Outstanding Job

Dear Sir:

The Mining World Editors have done an outstanding and interesting job of reporting in the special Sydvaranger issue. Having lived with many Norwegians here in Minnesota for the past two years, I was not too surprised at the determination and fortitude shown by the people who have completed this enterprise. Congratulations!

Paul T. Allsman
Region V Director,
U. S. Bureau of Mines
Minneapolis, Minnesota.

MINING WORLD

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 16 **APRIL 1954** **NUMBER 4**

SAMPLE LOCATIONS

Page

MINING WORLD

Capitol Concentrates 29
Muriel Sibell Wolle describes Bodie, California Joins the Ghosts 49
Activities of U. S. Mining Men 51
Index of Advertisers 84

WORLD MINING

International Panorama 33
White Pine Copper Develops with New Methods and New Equipment 34
HM&S Proves a Market for Tungsten Ores at Salt Lake City 37
How Homestake Rebuilt South Mill to Save Manpower and Horsepower by Nathaniel Herz, Chief Metallurgist, Homestake Mining Company 40
The Current Status of Cyclones as a New Classification Tool by A. J. Fischer, Assistant to the President, and R. D. Forger, Technical Assistant, The Dorr Company Engineers 44
Money Making Methods 48
Activities of International Mining Men 53
International News 55
Metal and Mineral Prices 66
Production Equipment Preview 67

THE COVER CIRCLE: One of the three service drifts extending to the crusher station at White Pine Copper. Development ors is being hauled up these drifts and on to the surface until completion of the belt conveyor haulage system.

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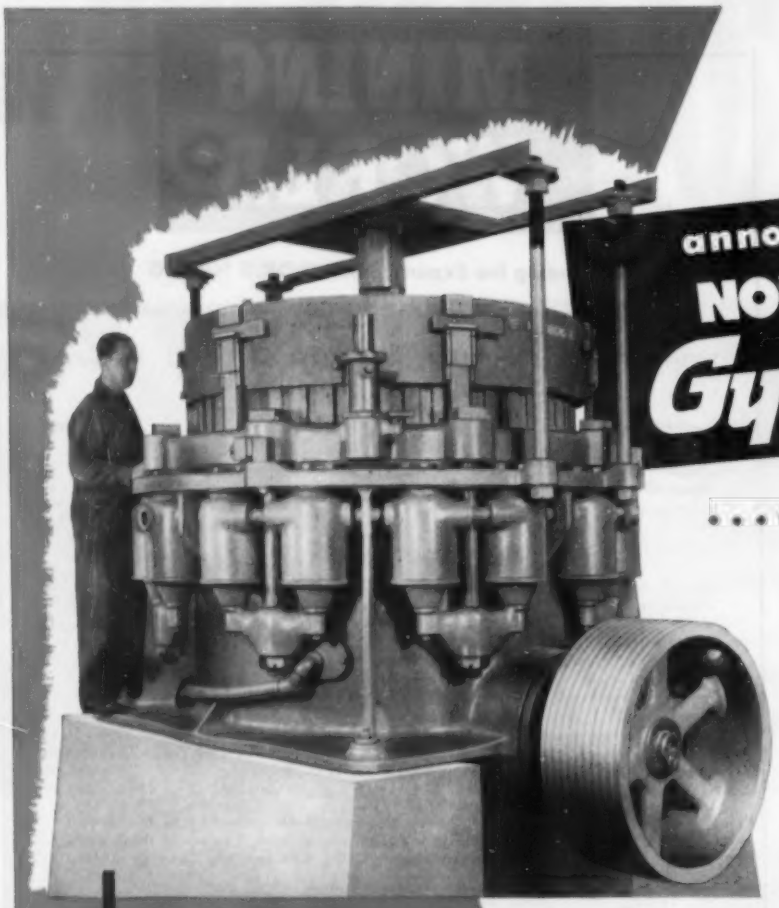

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● After years of extensive research and development, Nordberg now presents the *GYRADISC* . . . a new, revolutionary method of comminution that has been proved in the production of large tonnages of fine product in both metallic and non-metallic ore and mineral service.

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For full details, send for your copy of the new *GYRADISC* Bulletin 228—just off the press.

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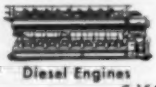

Diesel Engines

C 154

How Dorrco Worldwide engineering serves the mining industry throughout the world . . .

Producing 100 tons of triple superphosphate per day in Greece

PROBLEM: To design a 100 ton-per-day triple superphosphate plant to process low grade African phosphate rock. It was important to utilize as much of existing equipment as possible from a plant designed by Dorr 30 years ago, and operated continuously since that time. Equally important was the need to obtain equipment on the most economical worldwide basis.

HOW DORRCO WORLDWIDE ENGINEERING WORKED:

Initial contact was made by the client through our Associated Company in Amsterdam, Dorr-Oliver, N.V. Through DONV, the Consulting Engineering Department in Stamford submitted preliminary recommendations to the client. Engineers in Stamford and our Associated Company, Dorr-Oliver in Milan inspected the existing plant to evaluate all aspects of the situation. Based on this technical information final plans were developed, making maximum use of existing equipment. The required testing was carried out at the Westport Mill and the complete plant designed by Consulting Engineering in Stamford.

It is interesting to note that the required new equipment is being furnished from many areas. A considerable share, including a Dorrco FluoSolids System for calcination of the raw rock, is being supplied by Dorr from the United States. Dorr-Oliver in Milan is manufacturing the filtration equipment, and the client is purchasing the balance direct from European sources most advantageous to him.

In all, the full resources of all departments of Dorr and two of its Associated Companies abroad, as well as manufacturing facilities on two continents were placed at the client's disposal in order to provide the best answer to his particular problem.

FluoSolids is a trademark of The Dorr Company, Reg. U.S. Pat. Off.

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In India: Dorr-Oliver (India) Limited, Bombay.

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In Japan: Sanki Engineering Co., Ltd., Tokyo.

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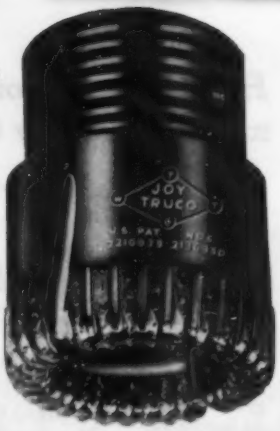

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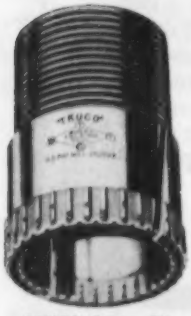
Here's the RIGHT Bit for You!

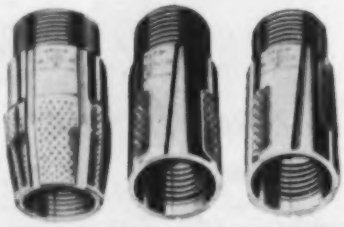
JOY-TRUCO and TRUCO DIAMOND BITS



TRUCO Casing Bit

TRUCO Coring Bit

Impregnated Casing Shoe



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Why not find out about "the right bit for every formation?" Our sales and resetting service is worldwide, and a Joy diamond drill specialist is quickly available on request to check your drilling problems and recommend the bit that will do the best job for you.

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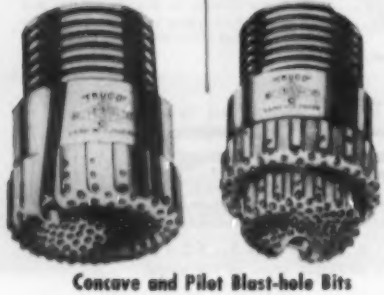

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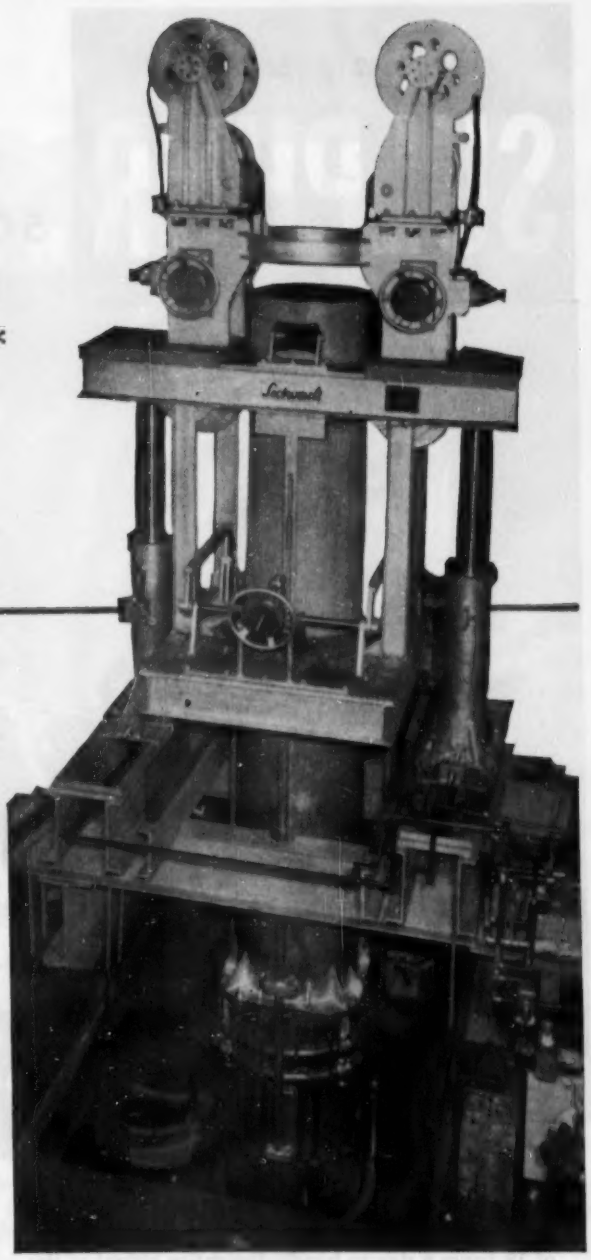

Lectromelt Self-Baking Electrode Gear gives you these advantages:

1. The complete structure is supported by two I-beams just above the furnace roof, resulting in lower and lighter building construction above.
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3. Remote-control clamping device allows quick and simple electrode adjustment and easy replacement of clamp shoes.
4. Pressure ring exerts uniform pressure and holds electrode circular.
5. Four cable supports provide minimum distortion of casing at clamp.

For a further listing of Lectromelt Self-Baking Electrode gear advantages, write Pittsburgh Lectromelt Furnace Corporation, 324 32nd Street, Pittsburgh 30, Pennsylvania.

Self-Baking electrode gear for a ferromanganese smelting furnace on Lectromelt's erection floor. Testing completed, it's ready for shipment.

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*REG. T. M. U. S. PAT. OFF.

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SULPHUR

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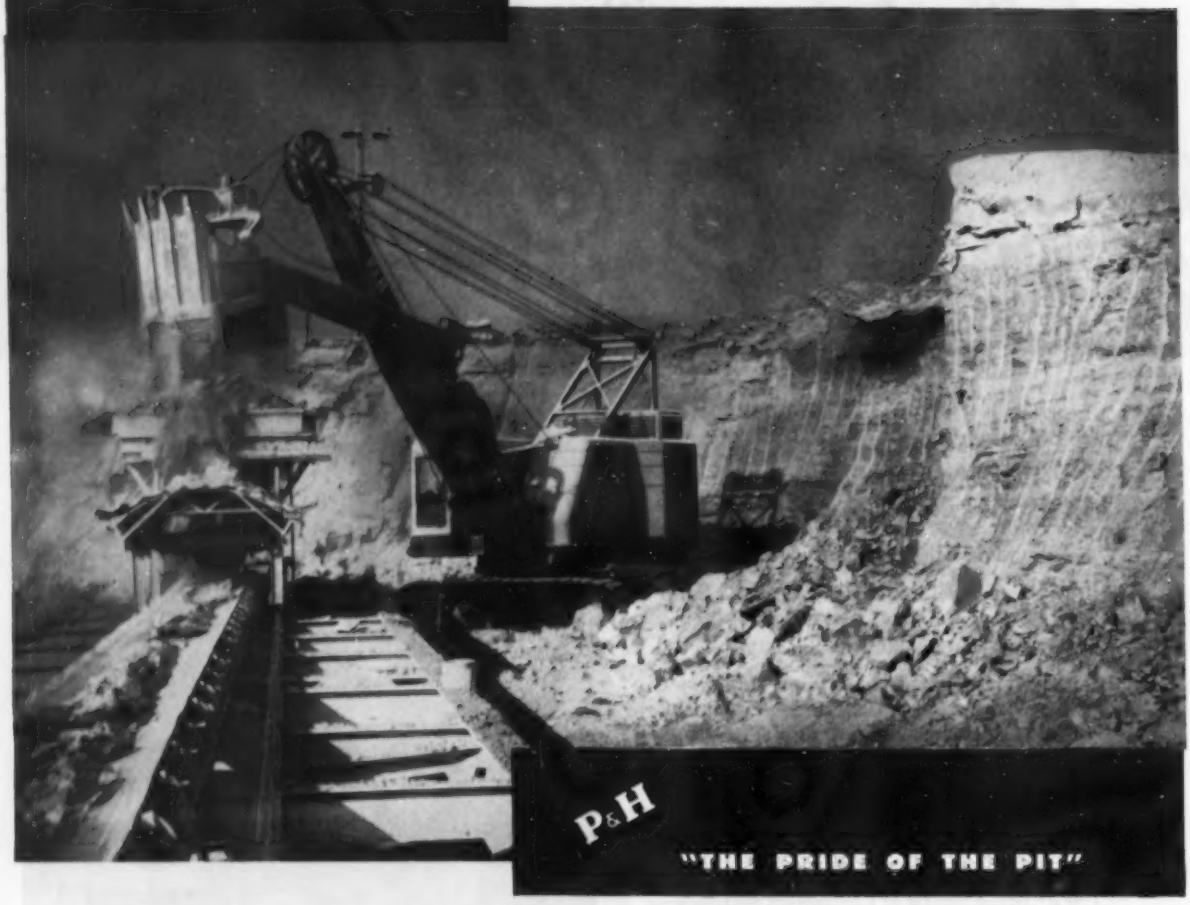

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Why does Freeport go P&H? One big reason is that only P&H Magnetorque* eliminates both friction clutches and DC commutators . . . big maintenance headaches anywhere, especially where corrosive atmospheres exist. And, electrical equipment is designed throughout for shovel service — *not adapted for it.* That's another important factor that means lower tonnage costs in any kind of open pit work.

We have many interesting facts about low-cost production in your type of work . . . facts that will explain why every third P&H Electric Shovel sold is a repeat order. Write us.

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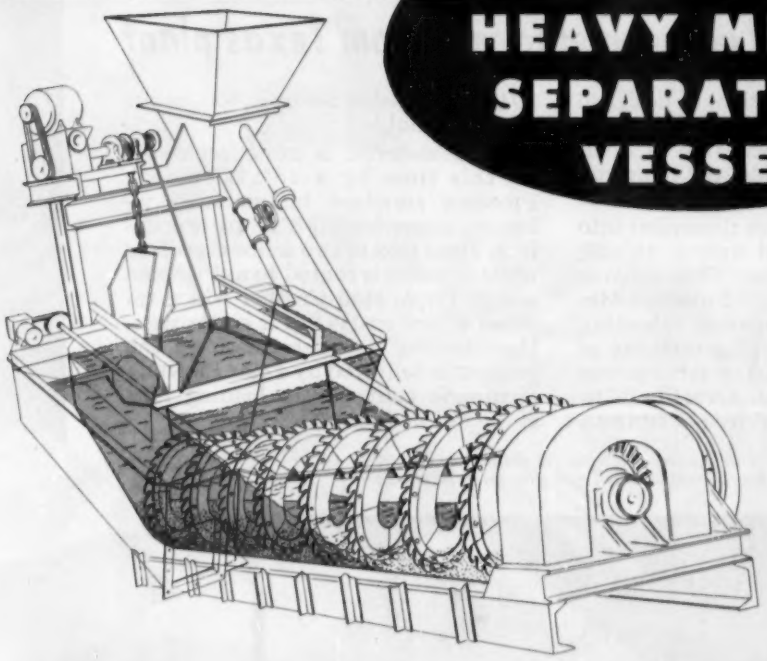

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Entire vessel is visible and accessible.

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Large pool area and volume facilitates better recovery of values from fine sizes.

Circulation of media at lower gravity and viscosity.

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Akins—the ORIGINAL spiral type classifier.

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How Sheffield gets top efficiency from Texas plant

● Neat, modern, functionally designed . . . and one of the most efficient in the world. That's a description of Sheffield Steel's new 300 ton-per-hour iron ore beneficiation plant at Rusk, Texas.

Trucks drop the ore (limonite) into a 50-ton bin located over a 48″x26′ PIONEER ORO Feeder. This delivers to a single deck 4′x10′ PIONEER Mesabi suspension-mounted vibrating screen where water for washing is supplied. The 6″ minus material passes directly to a blade mill. Oversize (6″ to 30″) is reduced to 6″ by a PIONEER 3042 Jaw Crusher before it, too, enters the blade mill.

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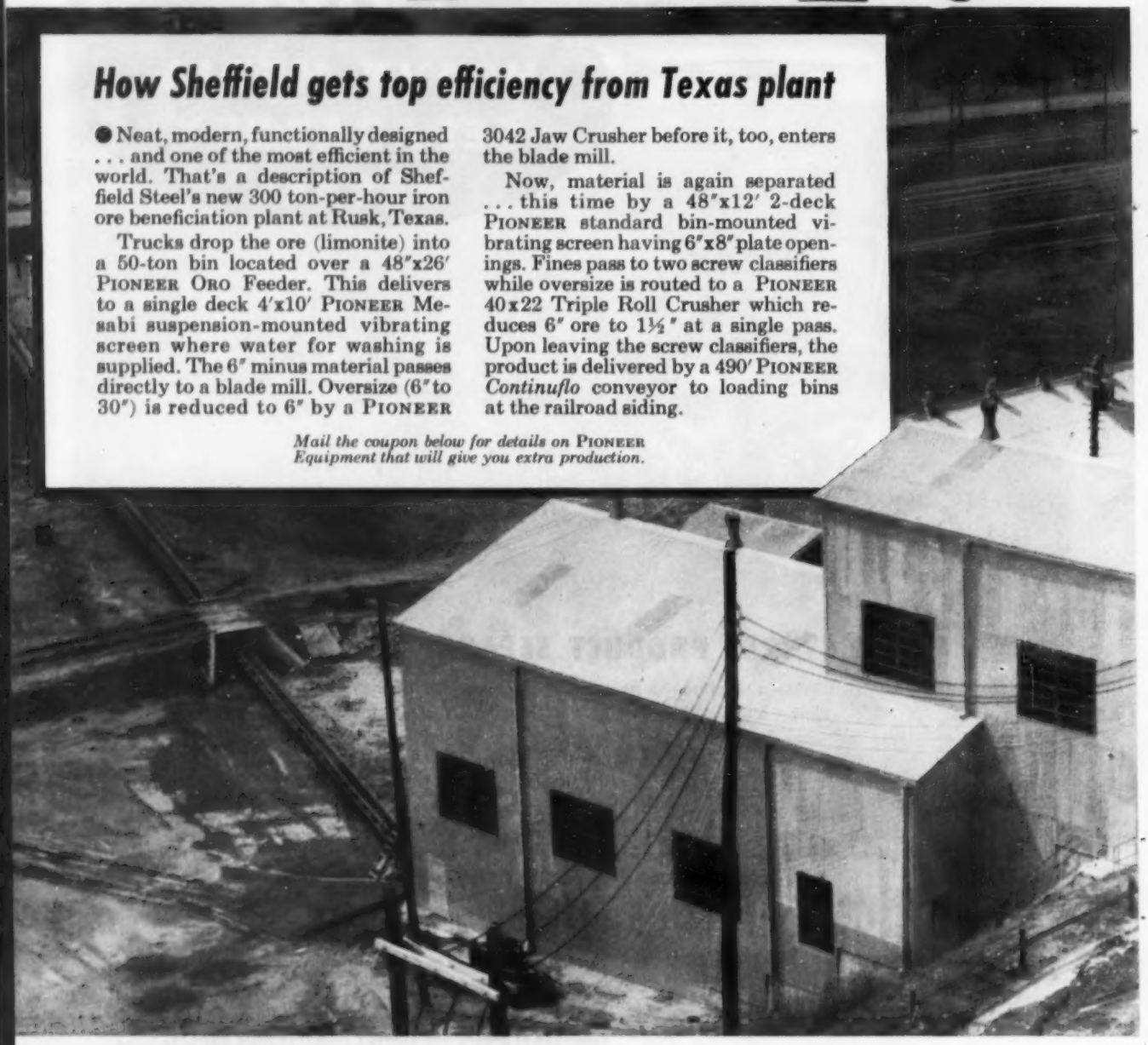
Mail the coupon below for details on PIONEER *Equipment that will give you extra production.*



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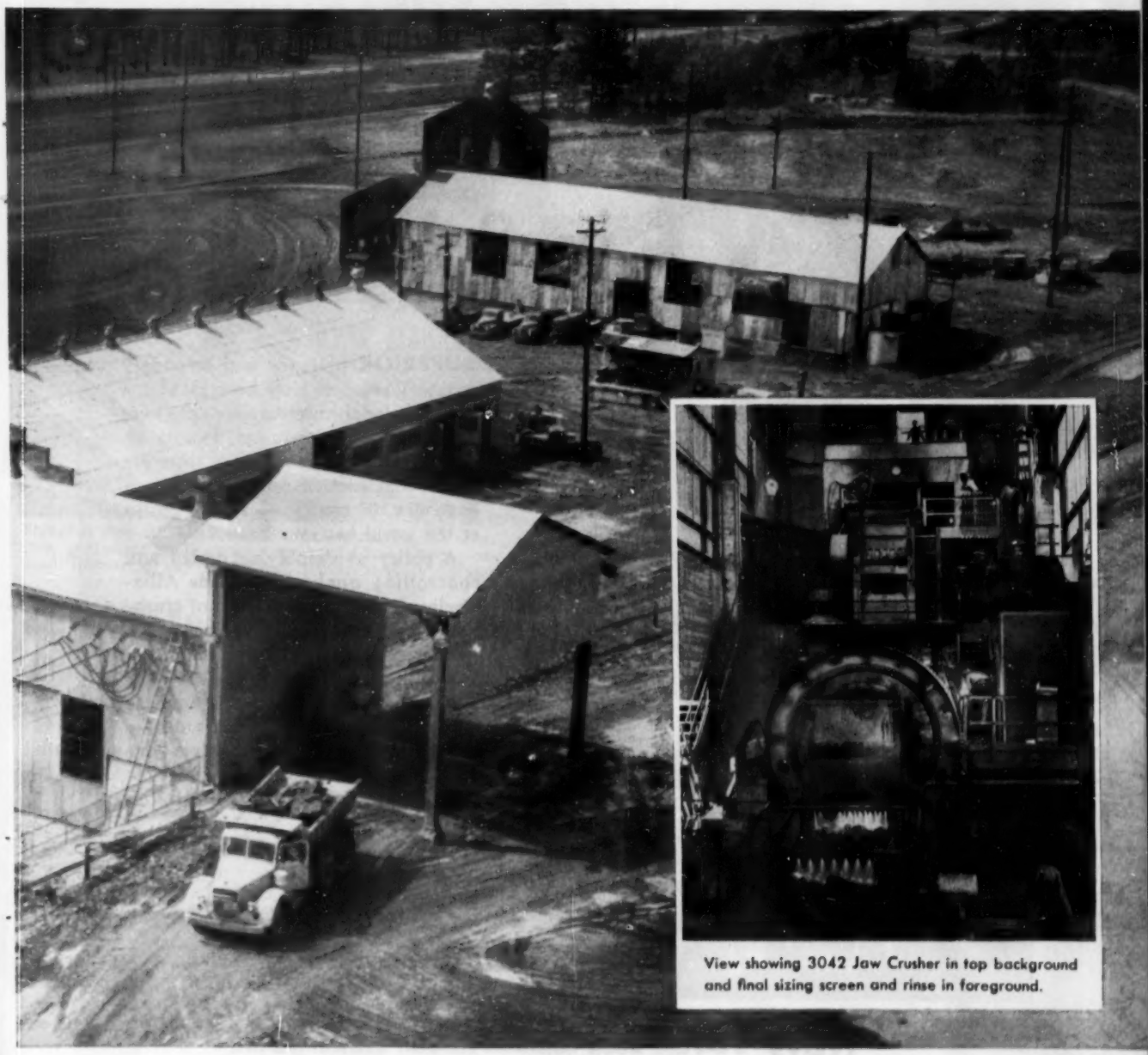
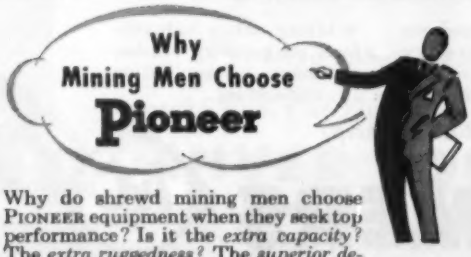
Pioneer

Continuflo EQUIPMENT

makes ore cost less



View showing 3042 Jaw Crusher in top background and final sizing screen and rinse in foreground.



Why do shrewd mining men choose PIONEER equipment when they seek top performance? Is it the *extra capacity*? The *extra ruggedness*? The *superior design and engineering*?

Actually, it's all of these which combine to offer the famous PIONEER EDGE . . . the operating advantage which is bringing extra profits to many a wise mine operater

PIONEER ENGINEERING WORKS, INC.
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

• Please send me information on the equipment checked.

☐ JAW CRUSHERS	☐ GRAVEL PLANTS	☐ APRON FEEDERS
☐ ROLL CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROCK PLANTS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ ORO FEEDERS	☐ BITUMINOUS PAVERS	☐ CONTINUFLO CONVEYORS

*Name*_____

*Company*_____

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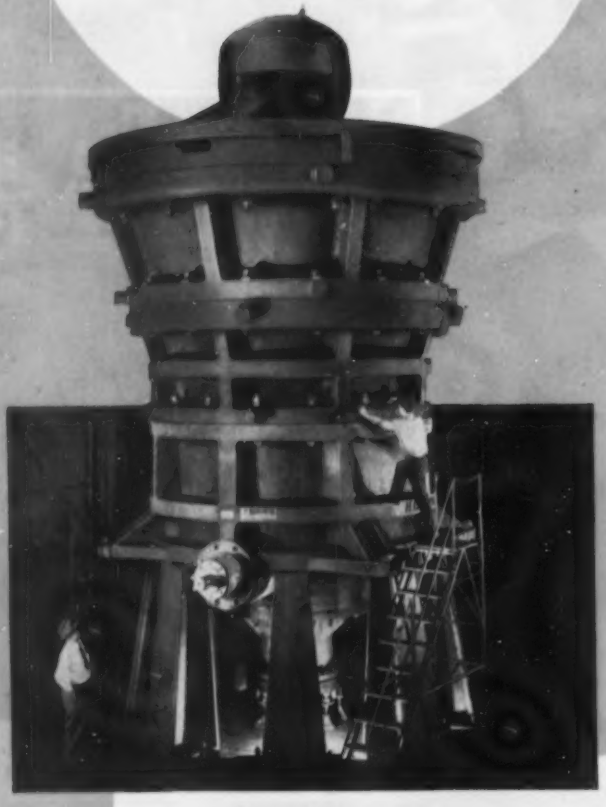
SUPERIOR Gyratory CRUSHERS

29 in 3 YEARS!



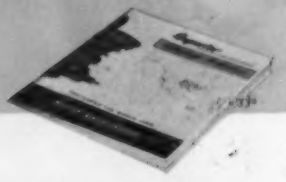
SUPERIOR primary and secondary gyratory crushers have been making a big name for themselves since they were introduced three years ago. Twenty-six are installed and operating . . . three are under construction now, including a huge 60 x 109 machine — largest crusher the world has ever known.

A policy of simplifying design and controlling quality has made Allis-Chalmers the leading builder of crushers. A continuing policy of *improving* crusher design has greatly extended this leadership.

This vast backlog of crusher application experience — over 75 years of it — is always available to you when you want to make sure of a successful installation. Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4319

Superior is an Allis-Chalmers trademark.



NEW 32-Page Book Contains Helpful Crushing Data

- Packed with factual "how to" information on figuring hp requirements, impact and compressive strengths.
- Step-by-step procedures for estimating gyratory crusher sizes, capacities. Examples are worked out.
- Many other valuable facts on gyratory crusher operation . . . application . . . engineering.

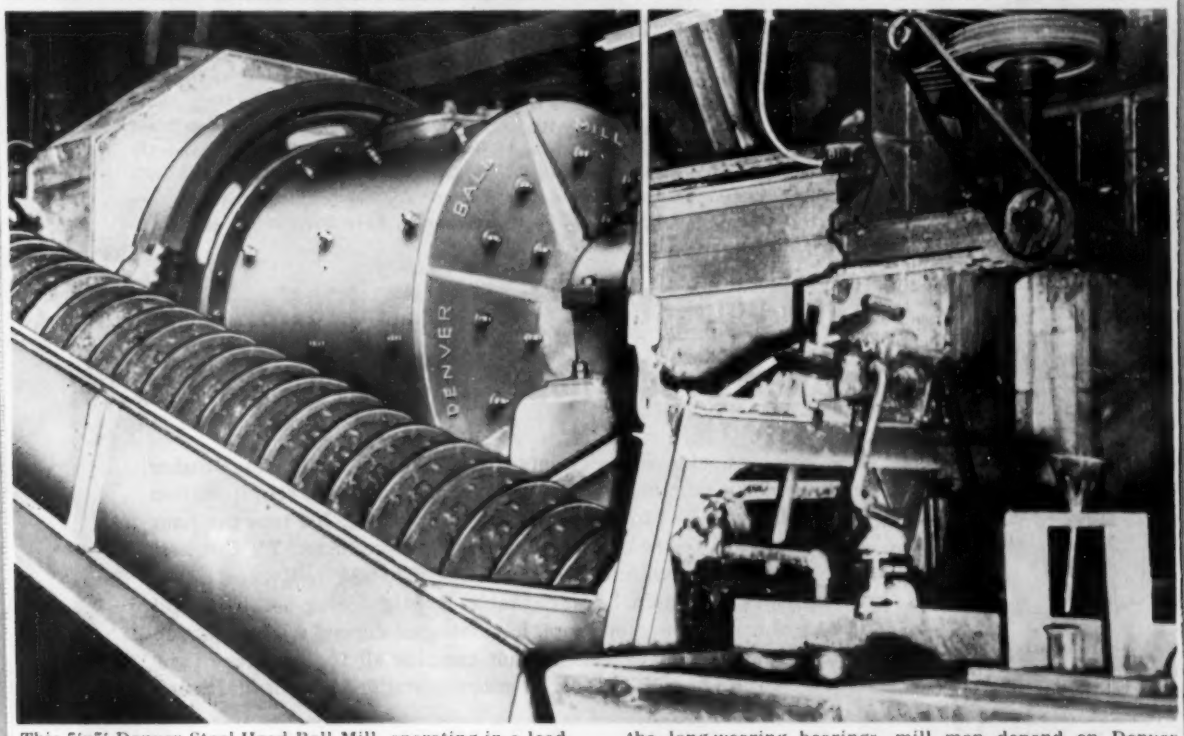
It's a book you'll want to have and keep!

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

DENVER BALL-ROD MILLS

Complete Milling Equipment—from testing, to feeder, to dryer!



This 5'x5' Denver Steel-Head Ball Mill, operating in a lead-zinc, gold-silver mill, shows the heavily reinforced steel head. Because of the crack-proof Denver Steel Heads and the long-wearing bearings, mill men depend on Denver Ball-Rod Mills for years of service. A No. 250 Unit Flotation Machine is pictured on the right.

Eliminate Shut-Downs Caused By Cracked Heads, Use Denver Steel-Head Ball-Rod Mills

Many years of continuous, high production with minimum maintenance and repair are possible with Denver Steel-Head Ball Mills. Because of the specially constructed steel heads in all Denver Ball-Rod Mills, the danger of cracking a mill head has been eliminated. Steel is the best insurance against cracked heads and resulting mill shut-downs. Your profits are greater because of the dependable, continuous service you get from Denver Ball-Rod Mills.

CRACK-PROOF STEEL HEADS

By using tough steel, four times stronger than ordinary cast iron, not one Denver Steel Head has ever been reported cracked. The steel heads are electric welded to a steel shell, giving you all-steel construction throughout (bolted steel construction is also available).

MAXIMUM BEARING LIFE

Denver Steel-Head Ball Mills are completely assembled and then the trunions are turned in a big lathe, making trunions absolutely true and accurate.

This accuracy makes bearings wear longer because the weight is evenly distributed over the entire bearing surface—giving lower pressure per square inch of bearing surface. Evenly distributed wear permits efficient use of babbitted bearings and eliminates ball and socket joints.

Write or wire today. Find out how these and many other advantages of Denver Ball-Rod Mills give you more dependable service and increase profits.

Free Technical Bulletin Sent on Request

Over 25 years of Flotation Engineering

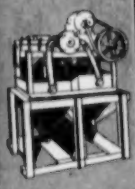
DENVER EQUIPMENT COMPANY

1400 SEVENTEENTH ST. DENVER 17, COLORADO

DENVER DISC FILTER

DENVER JAW CRUSHER

DENVER STEEL HEAD BALL MILL


DENVER MINERAL JIG

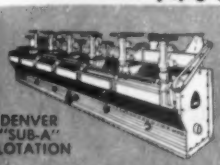
DENVER VERTICAL PUMP

DENVER SRL PUMP

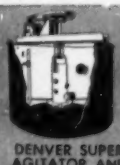
DENVER AUTOMATIC SAMPLER

DENVER STEEL HEAD ROD MILL

DENVER ORE FEEDER


DENVER "SUB-A" FLOTATION

DENVER "SUB-A" SUPER ROUGHER FLOTATION MACHINE


DENVER SUPER AGITATOR AND CONDITIONER

DENVER "SUB-A" UNIT CELL

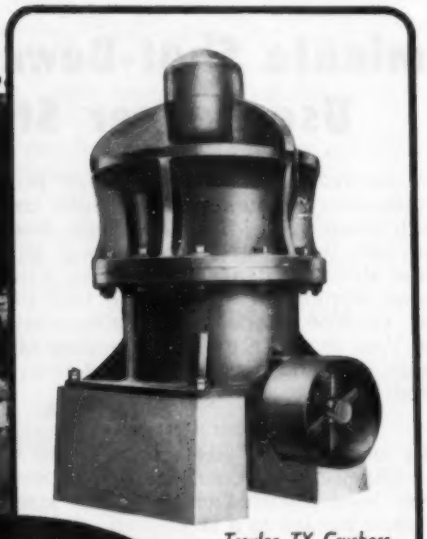
DENVER DIAPHRAGM PUMPS

DENVER DILLON SCREEN

Engineering Sidelights of Helsinki Olympic Stadium, Finland: *One of the most modern in the world, the Helsinki Olympic Stadium was intended as the site for the 12th Olympic games. World War II forced cancellation of the games, but the stadium's bold tower still stands as a dramatic expression of modern design and construction. The building of large stadiums was stimulated early in the 20th century by the use of a relatively new material—reinforced concrete. Since then, skillful engineers have daringly exploited the potentials of reinforced concrete to build huge stadiums where new records for capacity, as well as performance, have been established.*

Let the Compact Traylor TY Reduction Crusher Set New Production Records for You

The compact, simple design of a Traylor TY Reduction Crusher incorporates maximum strength with great efficiency to set production records like this: 43 tons per hour of $\frac{3}{8}$" product; 300 tons per hour of $1\frac{3}{8}$" product; or 540 tons per hour of $3\frac{1}{2}$" product. TY Crushers are built in 10 sizes with feed openings from 3" to 22". Every Traylor TY employs the original non-chokable, self-tightening bell head and curved concaves that, for years, have assured dependable production with little downtime loss. Why not examine all the features of the Traylor TY Reduction Crusher in greater detail? Send for illustrated Bulletin 7112 today.



Traylor TY Crushers are built in 10 sizes with feed openings from 3" to 22".

TRAYLOR ENGINEERING & MFG. CO.
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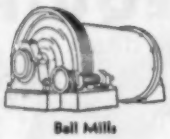
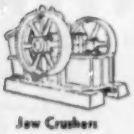
Traylor

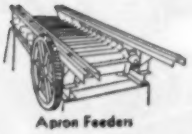
Primary Gyratory Crushers

Rotary Kilns

Secondary Gyratory Crushers


Ball Mills


Jaw Crushers


Apron Feeders

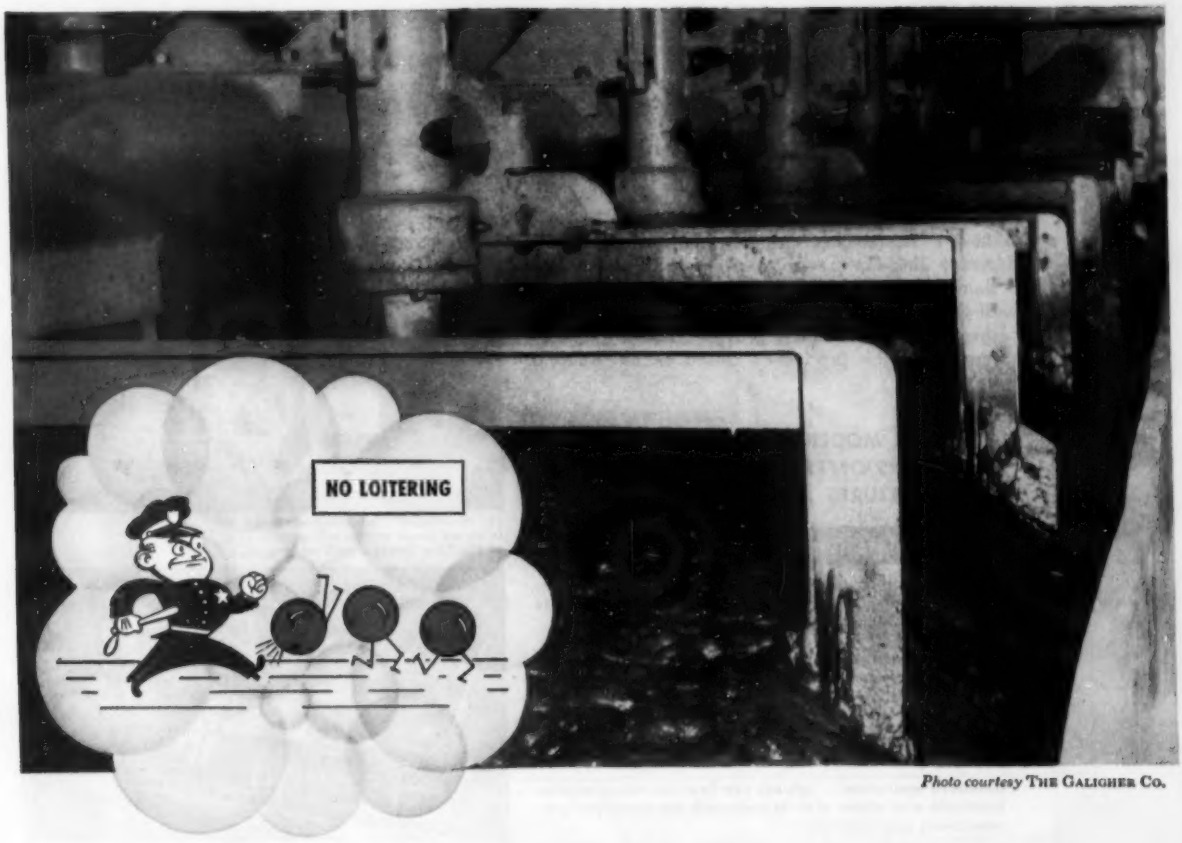


Photo courtesy THE GALIGHER CO.

Keep your bubbles moving

Keeping flotation cell bubbles moving is the way to low-cost milling operation. Overflowing solution blocks that way by damaging power cables. Damaged cables stop power, motors, bubbles, and profits.

Simplex-ANHYDREX Cables help reduce overflow damage with their specially compounded neoprene jackets. These jackets are highly resistant to alkalies, sludges, and oils that spill over the launder. That means these cables last longer and, therefore, cost you less per ton of ore handled.

Another advantage of these cables is the Anhydrex insulation. It has a guaranteed maximum water absorption of 20 milligrams per square inch. Even when completely submerged, it will retain its physical and electrical properties indefinitely.

With about one quarter of your total milling cost going for electric power, it makes sense to use the most dependable cables you can buy. Simplex-ANHYDREX Cables have that long life and dependability you are looking for. If you want to know more about how ANHYDREX helps to keep bubbles moving, write to the address below.

Simplex–ANHYDREX

SIMPLEX WIRE & CABLE COMPANY

79 Sidney St., Cambridge 39, Massachusetts

THE NEW JERSEY ZINC COMPANY
obtains efficient performance from WEMCO S-H CLASSIFIERS

At the Austinville, Virginia, plant of The New Jersey Zinc Company, Wemco S-H Classifiers are being profitably used for wet classification control of the grind. Used in the primary grinding circuit, these Wemco units have proven efficient and economical in this producer's closed circuit grinding operations.

78" Wemco S-H Classifier operating in closed circuit with grinding mill at The New Jersey Zinc Company.

Typical installation of Wemco S-H Classifiers in a closed grinding circuit.

84" diameter Wemco S-H Classifier.

ONLY THE MODERN DESIGN OF WEMCO CLASSIFIERS OFFERS YOU ALL THESE FEATURES

Metallurgical Advantages

Greater raking capacity — S-H (Special-Helix) design employs advanced pitch and vari-pitch helices to provide up to 100% greater sand conveying capacity.

Sharper separation — controlled agitation and larger effective pool area means less undersize in the sands, less oversize in the overflow.

Greater overflow capacity — up to 25% more effective pool area than other types of units.

Balanced operation — between overflow and raking requirements with wide choice of tanks and spirals for correct performance under any condition.

Better drainage — spiral action squeezes out maximum amount of free moisture leaving drier sand for easier conveying and closed-circuiting.

Design Features

Up to 40% greater shaft strength — large diameter tubular shaft gives maximum protection against shutdowns.

Long-life wearing shoes — of tough, thick alloy with large cross-section; cuts replacement costs to as low as 4/100 of 1 cent per ton of sand raked.

Anti-friction bearings throughout — grit-proof lower bearings; gudgeon-type upper bearing mounted on hub of main bevel drive gear.

Simple hydraulic lifting device — operated by either hand or pump; affords protection against clogging or jamming; permits lifting of spiral to start machine without draining tank.

Efficient gear drive — employs special worm gear speed reducer; uses standard speed motor.

Send For Free Classifier Bulletin

This new, 20-page bulletin contains valuable, up-to-date information on wet classification principles and their application to Wemco S-H Classifier design. Write today for your free copy. No obligation.

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WESTERN MACHINERY COMPANY
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Mobil Mills · Coal Spirals · MMS Thickeners · MMS Pumps · Sand Pumps · Agitators · Cone Separators · Drum Separators · Hydroseparators · Fagergren Laboratory Units · Fagergren & Stellanson Flotation Machines · S-H Classifiers · Attrition Machines · MMS Laboratory Units · Dewatering Spirals · Thickeners · Conditioners · Densifiers

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FOR INFORMATION ONLY

Quebec Pioneers New Nickel-Copper Smelter & Refinery

An Order-in-Council passed by the Government of the Province of Quebec on January 14, 1954 has paved the way for Eastern Smelting and Refining Company Limited to build a modern nickel-copper smelter and refinery at Chicoutimi, Quebec. The site is ideally located in the centre of new mining areas coming into production in Quebec and Labrador, with water and rail transportation at hand to bring concentrates for custom smelting and refining.

Site Potential

The site to be acquired from the Province of Quebec was formerly owned by Quebec Pulp & Paper Corporation. Eastern Smelting and Refining Company Limited also has obtained the power rights on the Chicoutimi River at the plant site. A regular output of 25,000 h.p. can be produced at this site which will be available to the smelter at approximately half the ordinary cost of purchased power.

The site extends over 90 acres of industrial lands in the town of Chicoutimi. Included in the acquisition are a shops building of steel and granite construction, with railway sidings readily available to the main line of the C.N.R., fully equipped with shop facilities including overhead travelling cranes, iron foundry, brass foundry and a full range of machine tool equipment for general repairs with adequate space for all laboratories and testing equipment for the proposed smelter, and an office building of brick construction with adequate space to accommodate the administrative and clerical staffs to be employed in the proposed smelter operations. The management considers that the land, buildings, machinery and equipment that will be utilized by Eastern Smelting and Refining Company Limited in its proposed operations have a replacement value of about $750,000.

Experienced labour for plant construction and operation is readily available at adjacent Chicoutimi and nearby Arvida. Adequate housing facilities are no problem in this heavily industrialized section of the Province.

Future Plans

Eastern Smelting and Refining Company Limited will proceed to develop this important site with the erection of a modern nickel-copper smelter and refinery to treat in excess of 200 tons of nickel-copper concentrates and 200 tons of copper concentrates daily. Related metallurgical and chemical facilities will be provided to recover the by-product sulphur and all contained secondary metals in the concentrates. Initially extensive investigations of various smelting and refining processes and pilot plant operations will be carried out utilizing the available buildings and equipment, to evolve plans and lay-out for the most efficient treatment process for the smelting and refining of nickel and copper concentrates that will be available to the Company.

This location and the proposed facilities will permit the economical treatment of concentrates from the Manitoba border to the Eastern seaboard. Arrangements have already been made to treat the concentrates from Eastern Metals Corporation Ltd. and Quebec Nickel Corporation Ltd. when these properties come into production. The Company is expected to be able to offer attractive rates for treating concentrates from present and future producers in the Chibougamau Camp, the Eastern Townships, the Sudbury district and as far west as the Gordon Lake area, near Kenora, Ontario.

Shipments of concentrates both eastward and westward will have the advantages of cheap water transportation through the Great Lakes and St. Lawrence waterway and up the Saguenay River to the site.

EASTERN SMELTING AND REFINING COMPANY LIMITED

(NO PERSONAL LIABILITY)

President & Managing Director—Andrew Robertson

Executive Office—Suite 605, 137 Wellington Street West, Toronto, Ontario

One of approximately 1200 on the Minnesota Iron Ranges, this 34-ton "Euc" is loaded by a 5 cu. yd. shovel at a large open pit operation. Rear-Dump models are available with semi-rigid or spring mounted axles, Allison Torqmatic drives and transmissions, or conventional 5 and 10 speed transmissions.

More Profit with "Eucs" in Mines and Quarries

■ Built for tough off-the-highway service, Rear-Dump and Bottom-Dump "Eucs" and Euclid Scrapers are cutting the cost of moving ore and overburden, sand and gravel, and stone on quarry and mining operations. Big payload capacity, fast travel speed and high job availability add up to more loads per hour and lower cost per ton or yard hauled.

■ Your Euclid Distributor will provide a hauling production and cost estimate for your operation . . . there's no obligation so get in touch with him soon. Have him show you how Euclid equipment can improve your profit picture.

Cable Yuklid—Code Bentley

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

This Bottom-Dump "Euc" is being loaded with 17 cu. yds. of sand and gravel from an overhead hopper for haul to the washing plant. Owner is Interstate Sand and Gravel of Covington, Ohio.

Ideal Cement Co. of Portland, Colorado uses 22-ton Rear-Dumps with quarry bodies to haul stone from the face to the crusher. Top speed of this Model 36 TD, with full payload, is 32.5 m.p.h. Spring mounted drive axle and Allison Torqmatic drive and transmission are important factors in stepping up production and profits at this quarry operation.

Euclid Twin-Power Scraper stripping overburden at a large gypsum quarry in Iowa. Powered by two 190 or 200 h.p. engines with torque converters and semi-automatic transmissions, this "Euc" self loads, has a struck capacity of 18 cu. yds. and travels up to 30 m.p.h. with full payload.

EUCLID THE PIONEER

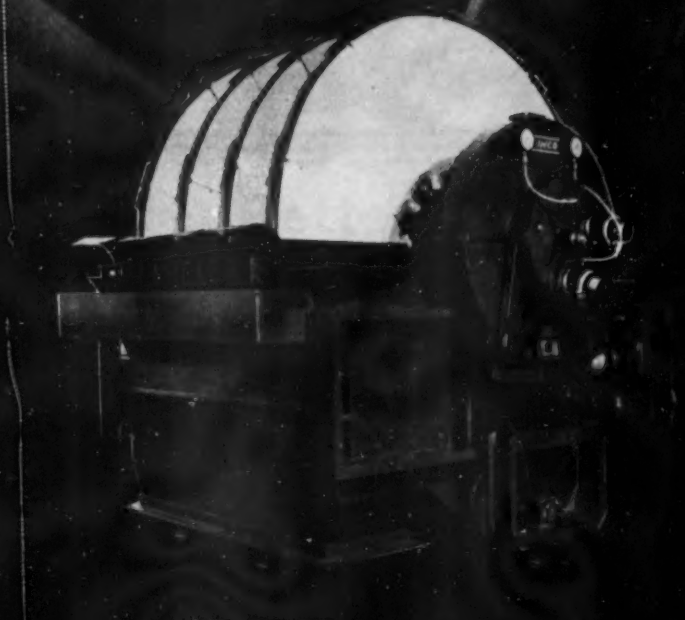
Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

INCREASE PRODUCTION and LOWER MOISTURE CONTENT

in dewatering metallurgical slurries with fast settling solids



An EIMCO Agidisc Filter
8' Diameter x 4 Disc Unit

Two critical factors in dewatering of metallurgical slurries with fast settling particles are improved by using Eimco Agidisc Filters.

These dependable filter units have been used on many different materials with remarkable success. In the dewatering of a copper concentrate an Eimco Agidisc was installed beside a filter of standard disc design. The Agidisc produced from 20-25% more tonnage and the discharged cake contained 1½-2% less moisture.

In the same plant a metallurgical drum type filter was running on the same feed. The moisture on the Agidisc was ½ of 1% lower than on the drum filter.

Other installations are showing equally as good or better results.

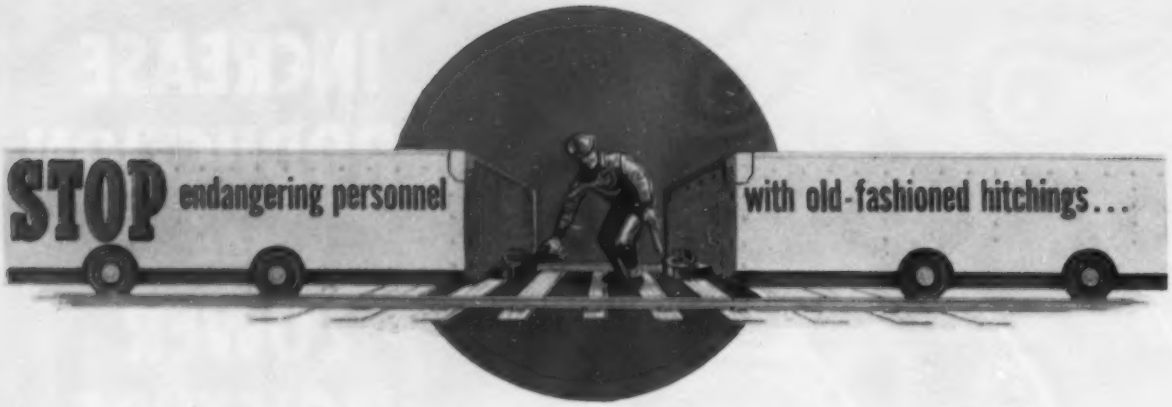
Let an Eimco engineer tell you about the Agidisc. Write for a bulletin on the Agidisc to The Eimco Corporation, Box 300, Salt Lake City, Utah.

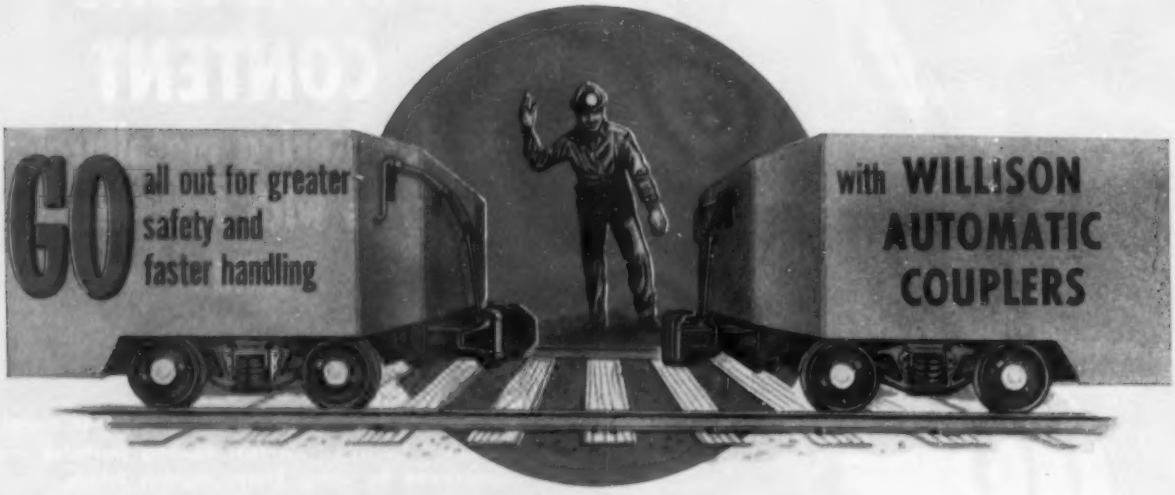
8-21

THE EIMCO CORPORATION

Export Offices: Eimco Bldg., 52 South St., New York City • Salt Lake City, Utah—U.S.A.

You Can't Beat An Eimco





With Willison Automatic Couplers there's no need for personnel to go between cars to couple or uncouple. That means safety—and faster handling because Willisons uncouple from either side. All Willisons couple with each other automatically—there's no matching of coupler heads.

For safety, faster handling and larger tonnages—Willison Automatic Couplers and National Multi-Pad Rubber Draft Gears.

A-9121

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY

Cleveland 6, Ohio

WILLISON AUTOMATIC COUPLERS • RUBBER & FRICTION DRAFT GEARS • NC-1 CAR TRUCKS
NACO STEEL WHEELS • NACO STEEL LINKS & SWIVEL HITCHINGS

Better Taconite shooting with extra energy from Du Pont Pelletol

IN MINNESOTA OPEN-PIT OPERATIONS

On tough jobs, such as breaking hard-shooting Taconite ore, the blast can be made more effective by adding Du Pont Pelletol to "Nitramon"® or "Nitramex"® charges in vertical drill holes.

A free-running blasting agent, Pelletol is readily poured in the hole during loading. Pelletol settles to the bottom . . . supplements the strength of the basic charge by filling the annular space around the column.

Whenever open-pit operations call for extra strength, Pelletol is the answer. It offers the safest and most efficient method of providing maximum energy at the bottom of the hole.

If you are not already familiar with Du Pont Pelletol, it will pay you to find out how this free-running blasting agent can help you with your blasting problems. For more complete information about Pelletol and other members of the Du Pont blasting team, ask the Du Pont representative in your own district. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT

BLASTING AGENTS

Products of Du Pont Research

DU PONT

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Spend less time changing bits more time drilling

TIMKEN® ROCK BITS ARE INTERCHANGEABLE

NO need to waste valuable drilling time switching steels. With Timken® interchangeable rock bits, you can switch quickly from one bit type to the other —right on the job. Dozens of different Timken multi-use and carbide insert bits screw right on the same threaded drill steel!

Because both Timken multi-use and carbide insert bits fit the same steel, there's no need to stock expensive double inventories of drill steels. In addition, both Timken bit types give these other two advantages: 1) made from electric furnace Timken fine alloy steel, 2) special shoulder union keeps drilling impact from damaging threads.

If you have a drilling problem, be sure to call upon our rock bit engineers. They're backed by over 20 years' experience in selecting the most economical bits for every drilling need. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO."

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small-diameter holes, very deep holes.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit ...for every job

GREATER OUTPUT LOWER UPKEEP WITH NEW TORQUE CONVERTER DRIVE

New standards of tractor-shovel performance are being set by the famous 1½ yd. Model HM "PAYLOADER" because a NEW Torque Converter drive has been added to its many features. A year of extensive field-testing proves that this new development insures faster, lower-cost materials handling because output is increased up to 1/3 and maintenance is drastically reduced.

Combined with the 4-speed, full-reversing transmission, the Torque Converter provides an unlimited range of automatically selected speeds to meet the load and operating conditions. Parts breakage and maintenance are less because shock loads are absorbed.

TORQUE CONVERTER DRIVE

MORE EFFICIENCY — Engine operates at most efficient speeds — no laboring or stalling

LOWER MAINTENANCE — Oil cushion absorbs load shocks—protects vital parts

EASIER OPERATION — Eliminates much gear-shifting and "clutching"

GREATER OUTPUT — Machine operates at highest speed in relation to load

Prove to yourself that this pioneer four-wheel-drive tractor-shovel, with torque converter, is the finest tractor-shovel available. Ask your "PAYLOADER" Distributor for a demonstration, or write The Frank G. Hough Co., 859 Sunnyside Ave., Libertyville, Illinois.

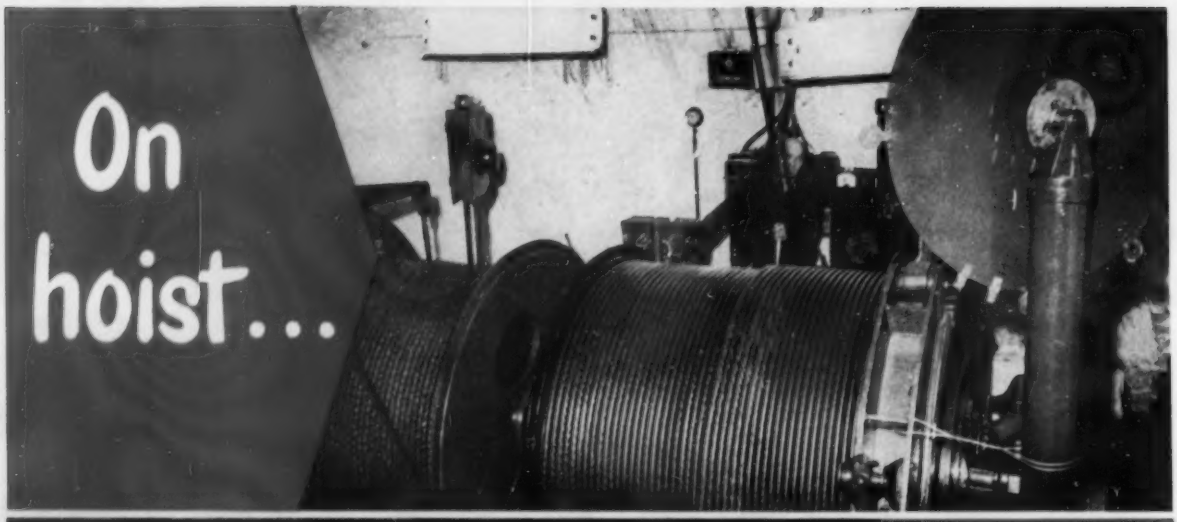
YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE

7 SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920

Write for full details on the big 1½ yd. Model HM, or on any of the six smaller "PAYLOADERS" — 1¼ yd., 1 yd., ¾ yd., ½ yd. or 12 cu. ft. sizes.



lower cost-per-ton because

Edwards Wire Rope stays on the job

WIRE ROPE that stays on the job with less down-time for replacement means safer operation and assures you lower cost-per-ton of material moved.

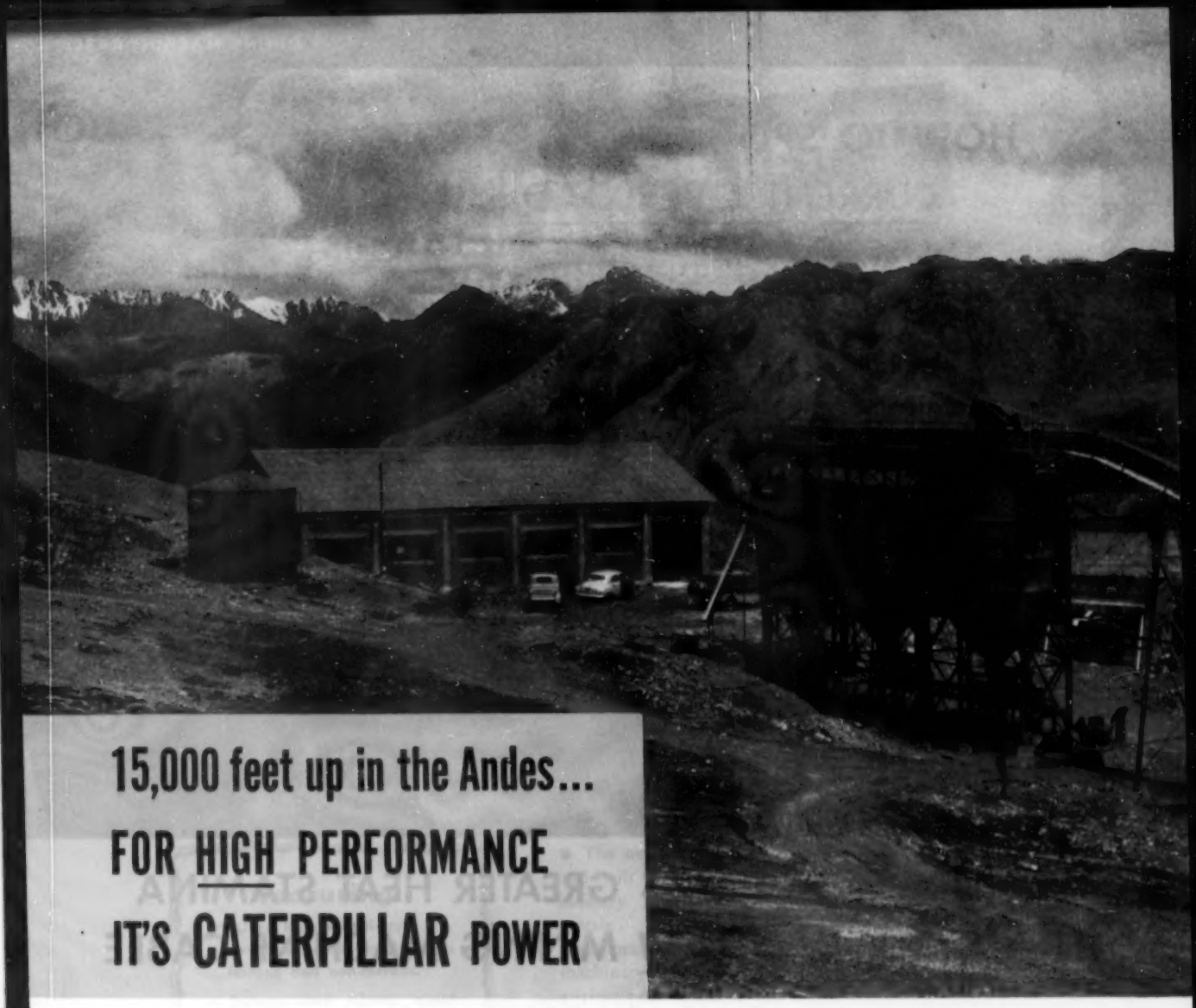
There's an Edwards Wire Rope built to give you long, trouble-free service on each specific mining operation, from hoisting to scraper work.

Technical Field Representatives are at your service on request, to help you select the right rope for every job from the complete Edwards line.

EDWARDS WIRE ROPE

E. H. EDWARDS COMPANY

General Office: SOUTH SAN FRANCISCO, CALIF., Los Angeles, Houston, Seattle, Portland



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At Ticlio, Peru — 86 miles east of Lima and highest point in the world reached by road and rail — four Caterpillar D397 Electric Sets furnish all power for this operation of Volcan Mines, Ltd. They run continuously in the thin mountain air, powering a concentrate plant with a 250-ton capacity ball mill. Daily output is 400 tons of copper, lead and zinc.

A job like this is a real test of engines. For round-the-clock, high-altitude operation, they must have stamina. And they must be reliable, because the whole operation, in a remote corner of the world, depends on them.

Volcan Mines chose Caterpillar D397s for the job. These rugged Diesel Electric Sets are built to deliver without pampering or down time. Caterpillar builds years of extra service into every engine with long-wearing aluminum-alloy bearings and pistons, "Hi-Electro" hardened crankshaft journals, and precision workmanship. And Caterpillar's special fuel-injection system means full and foul-free power on money-saving No. 2 furnace oil.

There are 12 sizes of engines and electric sets up to 500 HP and 315 KW. Your Caterpillar Dealer will help you pick the right unit for your job. See him today — and count on him whenever you need fast, skilled service and genuine Caterpillar parts.

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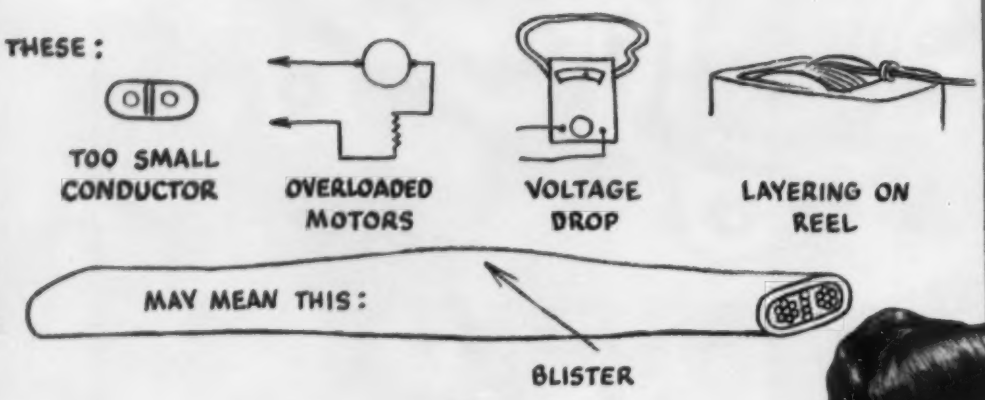
MINING MACHINE CABLE

HOW TO SPOT DAMAGE FROM CURRENT OVERLOAD . . .



. . . AND WHY THERE'S GREATER HEAT STAMINA IN ANACONDA'S NEW MINING MACHINE CABLE

Blisters, formed by gases from overheated installation, are a sure sign of cable overloading. A torn cable may result. Since you can't always control overloads, it's important to choose *quality* cable.

Today, due to better design, jackets and insulation, good cables shouldn't cook on the reel the way they used to. But this only makes overloads harder to detect. They still may be present . . . caused by too small a conductor, overloaded machines, voltage drop or even layering of the cable. With 4 layers on the reel, according to I.P.C.E.A., unventilated bottom layers lose 65% of capacity.

WHY THE NEW ANACONDA CABLES ARE SAFER

First, they are more flame-resistant. Jacket is made from a new neoprene formula. Improved cold-rubber insulation gives greater heat stamina. Patented breaker strip* insures a safer ground. No ANACONDA Cable has ever failed a U. S. Bureau of Mines flame-test!

CABLE LIFE NOW MUCH LONGER

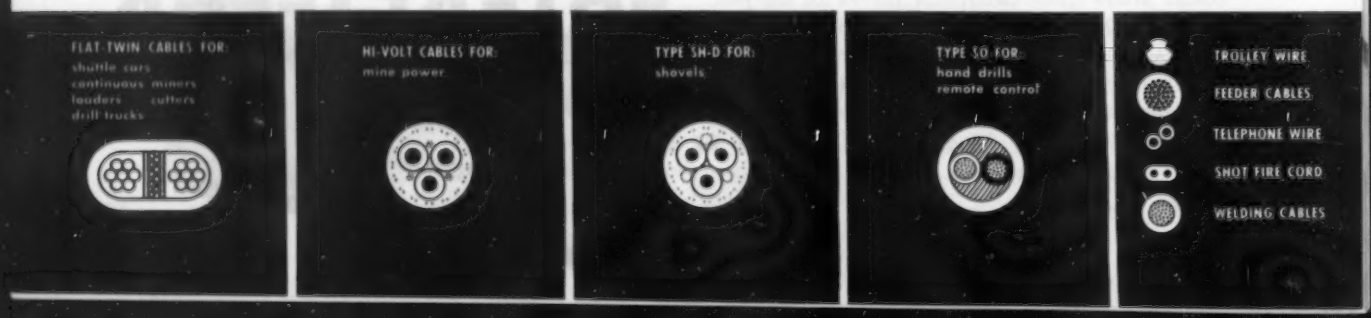
In 15 mines recently surveyed, ANACONDA Cables on shuttle cars are lasting up to 300% longer than cables made only a few years ago. Together, jacket and insulation protect these cables better—especially in wet mines where sliver-cuts can cause shocks. The cables are tougher. New-type stranding flexes better under tension.

All this means economy because *one* break in cheap cable costs more than you can save by buying on price. For a sample of this new cable, call your Anaconda Sales Office or Distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.* 53202

ANACONDA

TODAY'S HEADQUARTERS FOR MINE CABLE

*U. S. Patent No. 2,455,773



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Available with a wide range of signal and reject systems to meet specific requirements, the new Dings Electronic Metal Detector is built in several sizes to fit into practically any processing arrangement.

Let the experienced Dings engineering staff help in solving your metal detection problems. *See your nearest Dings representative or mail the coupon for free literature.*

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Load lines and boom lines on this shovel are just some of the many uses for tough, long-lasting Tiger Brand Wire Rope. Draglines, dipper hoist ropes, scraper and dump lines are also applications where Tiger Brand Wire Rope helps to keep down costs and give long, dependable service.

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Sound basic engineering and close supervision of manufacturing practices are just two of the reasons why Tiger Brand Wire Rope wears evenly, resists abrasion. Crane and shovel operators like the ease of handling Tiger Brand. And because it gives such good service under all conditions, "down time" is reduced to a minimum.

Services of a Tiger Brand Representative and Tiger Brand Field Engineers are always available to help solve your wire rope problems. If your wire rope application is an unusual one — or its operating conditions are severe — they will make specific recommendations for your equipment and conditions of service.

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UNITED STATES STEEL

CAPITOL CONCENTRATES

TARIFF COMMISSION REPORTS AWAITED BY DOMESTIC MINERS

March 31, 1954, is the deadline for the U. S. Tariff Commission's "General Investigation" report on the competitive position of the domestic lead-zinc industry. The commission is making this report as a result of a resolution passed last July by the Senate Finance Committee and the House Ways and Means Committee following the defeat of the Simpson sliding-scale tariff bill.

In this report the Tariff Commission is free to recommend any legislation it may deem advisable for correcting conditions found to be adversely affecting the competitive position of the lead-zinc industry.

A second report to be submitted by the Tariff Commission concerns the "Escape Clause Relief Petition" which was filed by the lead-zinc industry in September. The deadline for this report is June 15. However, since the testimony for both reports was taken at the same time, it is hoped that the two reports will be presented together, on or before the March deadline.

The Reciprocal Trade Agreement Act as amended provides that on favorable report by the Tariff Commission, tariff adjustments may be made by the President up to limits set by that law. The maximum tariff permissible under the law would be 2.55 cents per pound for lead and 2.1 cents for zinc, or an increase of about 1.5 cents per pound for each metal over present rates. At the hearings abundant evidence of injury because of excessive imports was submitted.

All segments of the mining industry are awaiting these reports with deep concern. Their recommendations, it is believed, will affect materially the course of action taken by President Eisenhower and the Congress in dealing with the lead-zinc crisis and also with similar difficulties which may be encountered by producers of other essential metals.

• *Patterson Wants Extension of Tariff Suspension*

Representative Patterson of Connecticut, following his custom of trying to get cheap copper for his manufacturers, has reintroduced his bill to suspend the copper tariff unless the price falls below 24 cents for any one calendar month. In supporting his contention that the tariff suspension be extended for another year, Patterson stated that we are a have-not nation with respect to copper and he wants "to see that the Connecticut people employed in copper and brass fabricating plants are not deprived of jobs through a copper shortage."

Patterson should not be worried. If a shortage occurs, our domestic mines can go back on full production. Unfortunately, it appears as though Patterson's constituents will soon get copper good and cheap because of the world surplus.

• *Idaho Republicans Call For Assistance*

The Republican State Central Committee of Idaho has sent a resolution to the Congress calling upon the "President of the United States, the Congress, the Tariff Commission, and all other agencies of government to immediately take whatever steps are necessary in their good judgment to terminate this vicious and destructive throttling of the mining industry upon which the strength and prosperity of the nation so largely depends." The committee pointed out that "over a period of years past, excessive imports of lead and zinc have flooded the American market with supplies of these metals which could not be absorbed and as a consequence the price of these vital metals has been forced down below the cost of production in the mines of the West, and there has been at least a 70 percent shutdown of these mines."

The resolution is a Jim Dandy and, no doubt, other state committees and legislatures will resolve in similar fashion. The plain and simple facts of the matter are, unfortunately, that the White House apparently has no idea what can be done and at the same time continues to coddle our good neighbors.

• *Zimmerman Comments On Copper Market*

According to Dr. Joseph Zimmerman, editor-in-chief, *Daily Metal Reporter*, the copper market has "stumped the experts." A drop in the price of copper, he said, was expected not only by consumers but by producers as well as far back as June of last year, but copper is still selling at 29.50 to 30.00 cents a pound—and may continue to do so until after Chilean copper is offered for sale in the world markets at the world price.

Because of its arbitrary price policy, the Chilean government has accumulated about 170,000 tons of copper, Dr. Zimmerman declared. Since last June Chile has been negotiating the sale of 100,000 tons of copper to the United States government for the stockpile, but not until Chile accepts the "package deal" that our State Department has offered are these negotiations likely to result in a contract, he explained.

Dr. Zimmerman also commented that domestic and foreign consumers have been getting along without Chile's copper, and that when Chile resumes selling freely, the supply will exceed current world needs. Some of the large domestic copper companies have seen the handwriting on the wall, he added, and have begun to cut production.

He predicted that consumption of copper this year may drop 15 percent below that of 1953, but feels this is no reason for serious alarm since 1953 was a good year.

• *Unusual Report Made By Budget Bureau*

On February 15, the Bureau of the Budget made a report to the Senate Interior and Insular Affairs Committee on S. J. Resolution 109, a bill to establish a joint committee to investigate the gold mining industry. As setting up such a committee is an internal matter with Congress, it is hard to understand why the Budget Bureau was asked for a report on the bill. Realizing this, Deputy Director Roland Hughes said: "This office wishes to express no opinion on this subject which is largely a matter of Congressional organization for resolution by that body."

For the Bureau of the Budget to want to keep its fingers out of anything is certainly a new turn of events!

Considerable progress is being made in the use of newer Cyanamid Reagents and Processes for profitable beneficiation of many non-metallics. Preconcentration by Heavy-Media Separation is also widely used to up-grade ore-bodies hitherto deemed too low-grade for profitable operation.

We invite you to discuss non-metallic beneficiation problems with Cyanamid Field Engineers who can give you the benefit of Cyanamid's world-wide experience in this field and bring you the latest findings of Cyanamid Mineral Dressing Laboratory.

Orders for Cyanide, Flotation Reagents and other metallurgical Chemicals may be placed with our New York office or with American Cyanamid Company, 1440 Broadway, Oakland 12, California; El Paso, Texas; c/o Weicker Transfer & Storage Co., Denver, Colorado; or c/o Goodwin & Mayflower Moving & Storage Co., Spokane, Washington.

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• *Industry Must Unite On Plan*

The further decline in the prices of lead and zinc and the drop in copper futures seem to be causing only slight concern in the Administration, but a great deal in industry. Tariffs, adequate to adjust the situation, and import quotas are not acceptable under present "trade-not-aid" policies (though the aid still is going out in great gobs); but Washington sources indicate that if industry demand becomes great enough there may be a definite trend toward some form of subsidies. Labor organizations are alarmed at decreasing employment in base metal mines and are beginning to press their Congressmen more and more. Industry to date has been too much concerned with efforts to obtain tariff increases to realize that there must be a serious study of other methods of controlling the situation if domestic mining is to be kept operating. Congress will act if industry will unite on a single plan which does not interfere with the Administration's foreign trade policies.

• *Policy Decision Awaits Committee Report*

On February 16 four Senators waited on the President to point out to him the difficulties facing the domestic lead and zinc mining industry. The committee originally appointed for the purpose comprised Hayden of Arizona, Anderson of New Mexico, Dworshak of Idaho, and Millikin of Colorado. Due to the illness of Senator Millikin, Malone of Nevada served as his substitute. The meeting was set for the 16th because it was presumed that the report of the President's Mineral Policy Committee would be available by that time, but it was not. The President therefore told the Senators that he was not prepared to make any definite policy decisions pending receipt of the report.

One of the committee of Senators said after the meeting, "The President did express a lively interest in the proposal that zinc and lead be purchased for the stockpile of strategic materials and indicated that he would have an examination made of that possibility at an early date."

Gabriel Hauge, the President's personal economist, has been assigned to "keep an eye" on all aspects of the domestic mining industry.

The reports on the conference give one the uneasy feeling that the top brass in the White House and in the Office of Defense Mobilization actually have no idea what to do about the situation.

COMING CONVENTIONS

April 9, 1954. Lake Superior Mining Geology Symposium. University of Minnesota Center For Continuation Study. Hibbing, Minnesota.

April 20 and 21, 1954. The 36th Meeting, AMERICAN ZINC INSTITUTE, Hotel Statler, St. Louis, Missouri.

April 29, 30 and May 1, 1954. PACIFIC NORTHWEST METALS AND MINERAL CONFERENCE, Multnomah Hotel, Portland, Oregon.

May 24 through 27, 1954. The first SYMPOSIUM ON INSTRUMENTATION for makers and users of instruments for industrial hygiene. University of Michigan Institute of Industrial Health, Ann Arbor, Michigan.

October 5 through 9, 1954. Annual fall meeting INDUSTRIAL MINERALS DIVISION AIME, Lake Placid, New York.

"We found T5X consistently superior..."

Roy Hill
General Field Superintendent
Mineral Materials Co.
Alhambra, California

"I guess the first reason we had for trying T5X was that it seemed to meet specifications for use in so many different pieces of our mining equipment.

"After testing this fine oil on several jobs over many months, we found T5X consistently superior to a variety of lubricants we previously considered indispensable. Of course, using T5X exclusively simplifies maintenance in the field, and what's more, inventory and supply problems are minimized... important considerations when everything must be hauled miles into mountainous areas.

"As in all our operations, we use nothing but Union fuels and lubricants in the crusher, stationary engines, shovels, dozers and trucks at our newly-opened Cushenbury, California, limestone quarry."

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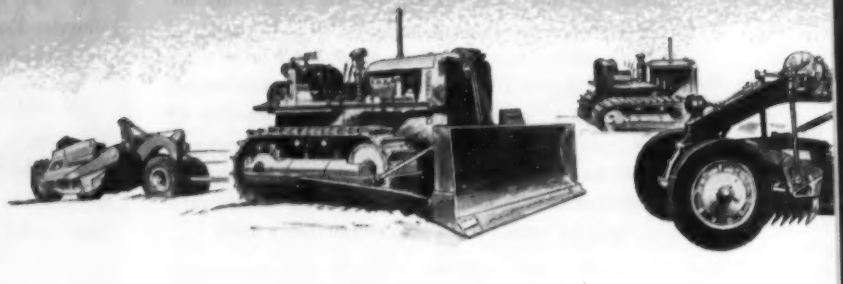

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Only your *Caterpillar Dealer* offers you this across-the-board selection. The best source of new machines, he's also your best source of used machines. Whether you're in the market for one, a few or many, he's the man to see for your *best* buy. See him today for complete details on guaranteed used machines!

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(1) "BONDED BUY" Only the best in used Caterpillar-built equipment. Each "BONDED BUY" machine is backed by a Dealer's Guarantee Bond equal to the purchase price of the machine up to a maximum of $10,000. This provides a guarantee for thirty days against unsatisfactory performance due to defective parts. If a part should prove defective within the guarantee period under the normal conditions of your job and with proper maintenance, your dealer will put your machine back into operating condition *with no charge to you for parts and labor* up to the amount of the bond. The Dealer's Guarantee Bond is backed by The Travelers Indemnity Company. Your Caterpillar Dealer gives you this protection with your purchase of a "BONDED BUY" machine. Look for the "BONDED BUY" symbol—it's your assurance of the best in used equipment.

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Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

April, 1954

INTERNATIONAL PANORAMA

LIMA, PERU—Republic Steel Corporation has completed its first diamond drill holes on the Acari iron ore concession. Utah Construction Company is contracting the exploration.

MOA BAY, CUBA—Freeport Sulphur Company has been awarded an accelerated write-off allowance of $55,250,000 by the United States government for a new nickel-cobalt mine here and a refinery near New Orleans, Louisiana.

MANITOUWADGE LAKE, ONTARIO—Diamond drilling by Geco Mines has disclosed a major copper-zinc-silver deposit. Mineralization has been found in widths over 100 feet and to a 500-foot depth.

EUREKA, NEVADA—Eureka Corporation, Ltd. has started shaft sinking in the Adams Hill area to develop gold-silver-lead-zinc ore at a depth of 940 feet found by diamond drilling.

IPOH, MALAYA—Possibilities of a tin output quota in Malaya encouraged operators to reopen 23 mines in January.

GRAND JUNCTION, COLORADO—In three years more than $3,000,000 in bonus payments have been made to Colorado Plateau uranium producers. Payments have been made for 388 properties.

TONOPAH, NEVADA—Stoping and shipping of silver-gold ore is to be started at the Summit King mine here by the Summit King Mines, Ltd. following a successful development program.

SYDNEY, AUSTRALIA—Rutile production of 40,000 tons in 1953 set an all-time record, a large tonnage of which was shipped to the United States.

AURORA, MINNESOTA—Erie Mining Company has awarded a contract to Foley Brothers for the construction of its taconite plant, railroad, and Two Islands harbor on Lake Superior. Erie's plant will be the largest beneficiation plant ever built from the ground up.

MONTREAL, QUEBEC—The American Smelting and Refining Company and the United Asbestos Corporation, Ltd. have joined forces to develop an open pit mine and build a 5,000 ton per day asbestos mill at the Black Lake deposits.

NICARO, CUBA—The Nickel Processing Company, controlled by National Lead Company, will increase capacity of the United States government owned nickel plant here by 75 percent. Estimated cost is $43,000,000.

TEXAS CITY, TEXAS—Texas City Chemicals, Inc. is now recovering byproduct uranium at its new phosphate products plant here. The plant processes Florida phosphate rock.

SCHEFFERVILLE, QUEBEC—The Iron Ore Company of Canada has completed its 360 mile railroad from Seven Islands ahead of schedule. Initial ore shipments are scheduled in mid-summer.

WALLACE, IDAHO—The Vulcan shaft is being sunk an additional 400 feet to the 3,400 foot level by the American Smelting and Refining Company. Diamond drilling has shown silver bearing tetrahedrite ore below the mine's bottom level.

SANTIAGO, CHILE—Production of copper in this country will be reduced about 30 percent when the government approves copper producers requests to lay off employees.

NOGALES, ARIZONA—The Duval Sulphur and Potash Company has started its second set of surface diamond drill holes looking for copper and molybdenum at the Coronado Mines, Inc. claims here.

MONTREAL, QUEBEC—The Molybdenum Corporation of America has started diamond drilling near the St. Lawrence River for uranium, thorium, columbium, and tantalum.

NACOZARI, MEXICO—First shipment of molybdenum concentrate from the Nacozari mine have been made by the Ben Williams Company. The 50 tons of concentrate were shipped to England, Japan, and France.

Homestake Contracts Adit At Little Beaver Mine

The Homestake Mining Company has contracted for the driving of a 3,000-foot adit to develop its Little Beaver uranium claims in Grand County, Utah. The adit will be driven under contract by the Centennial Development Company of Eureka, Utah. It will be portaled in a small canyon a short distance from the main road in Steen Canyon leading to the Mi Vida mine of the Utex Exploration Company. The adit will be driven south easterly through hanging wall beds (Wingate and Chinle) to develop uranium ore indicated by diamond drilling. While the initial cost of a vertical shaft to reach the ore body might have been cheaper than the long adit, it would have been more expensive to build roads and grade for a shaft location. If a substantial tonnage of ore is mined the adit also has the advantage of a lower cost operation.

Homestake is also continuing its diamond drilling program on the La Sal Mining Company's claims which Homestake recently acquired. The La Sal claims are northwesterly of both the Mi Vida mine and the new shaft of the Cal Uranium Company. Ore was discovered in November 1953 by diamond drilling on the La Sal claims by T. C. Hudson, La Sal president. One diamond drill hole is reported to have shown 40 feet of mineralization while sections of core from other holes assayed up to 5.0 percent U_3O_8.

Paul Henshaw is in charge of Homestake's Utah uranium operations.

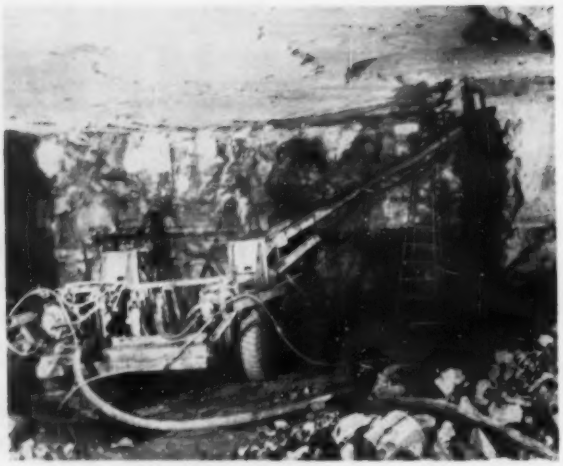
INCO Increases Creighton Mill To 12,000 Daily Tons

The capacity of the Creighton mine concentrator of The International Nickel Company of Canada at Copper Cliff, Ontario has been enlarged to handle 12,000 tons of ore per day, adding 20 percent to the concentrator's previous capacity.

This is the second time the mill has been expanded in response to increased nickel demand for defense and civilian requirements. When it was designed in 1948, it was to have a daily capacity of 6,000 tons, but plans were changed in 1950—two weeks after outbreak of the Korean War—to enable the mill to accommodate 10,000 tons of ore per day. The new capacity of 12,000 tons, therefore, is double what was originally planned.

The mill building has been enlarged to a length of 465 feet; it is 175 feet wide and 70 feet high. Two crushers have been added to the original four. Thirty-six flotation machines were also added, bringing the total to 180.

The concentrator is located at the site of Creighton No. 7 shaft, completed in 1931 at the Creighton mine which is one of the Inco's oldest operating mines. The shaft brought to 14 the number in operation at the company's mines.



LEFT: Drilling the initial hole, 11 to 14 feet deep in the center of the drift face, with the electric-powered rotary drill, mounted on a Joy Diesel-electric shuttle car. The drill is manufactured by Ka-Mo Tools Inc. of Cicero, Illinois. RIGHT: Drilling the remainder of the round with an air-powered mobile jumbo.

White Pine Uses New Methods And

Underground development of the White Pine Copper Mine near Ontonagon, Michigan, is about one-third finished. Driving of the mine adit began in late March, 1953, and as of February 15, 1954, 225,000 tons of development ore had been removed. The property is unique in that it is the first copper sulphide deposit in the Upper Peninsula of Michigan to be developed for large-scale mining—past production from that area being confined to native copper deposits in rather steeply dipping beds.

The average dip of the White Pine ore body is about six percent and the mining system has been predicated upon mobile, trackless equipment and mining techniques common to the Birmingham, Alabama iron mines; the potash mines near Carlsbad, New Mexico; and the zinc deposits of the Mississippi Valley.

The White Pine Copper Company is the wholly owned subsidiary of the Copper Range Company, 24 Federal Street, Boston, Massachusetts; and the project is financed by a $57,185,000 construction loan at five percent interest, administered by the Reconstruction Finance Corporation, and by the addition of $13,000,000 from the parent company.

White Pine operations are under the direction of Harold B. Ewoldt, vice president and project manager, and Stanley H. Cohlmeyer, assistant project manager. Mine development is under the supervision of R. F. Moe, mine superintendent, and C. A. Haberlen, chief mine engineer. The late L. E. Young, who served as mining consultant, was instrumental in laying out the mining program.

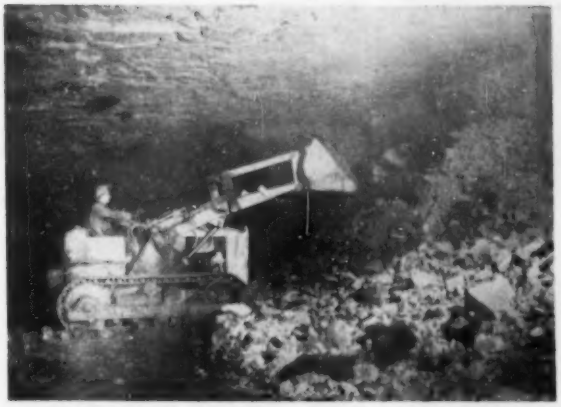
History

Just prior to and during the First World War, 18,233,169 pounds of copper were produced at White Pine from a native copper deposit. At the close of the War, the property lay dormant and was purchased by Copper Range Company in 1929. In 1937, a diamond drilling program was initiated and continued until 1950. During this period a test shaft known as the Schacht Shaft in honor of a former president of the company was sunk in the ore body, some 8,000 feet of development drift driven and 100,000 tons of ore mined for beneficiation tests. The engineering data obtained during this exploration period gave factual information for use in design of the plant. Supplementing this data, company engineers and consultants visited several operating properties to obtain information on specific problems. During this exploratory period, the advent of World War II accelerated the demand for copper and early in 1942 the government asked Copper Range Company to make a study of the cost and feasibility of a partial development of its White Pine ore body.

Time was really the essence of the problem and the restrictions on the use of many materials going into the work did not help the situation. By 1943, when a "meeting of the minds" had been reached between the Owners and the Defense Plant Corporation, the War had taken a definite turn for the better, and it was not believed that copper from White Pine could be made available in time to help relieve the war-time emergency and the project was dropped.

With the outbreak of hostilities in Korea in 1950, the country again found itself short of copper and the government requested Copper Range Company to make a study of a much more complete development of its White Pine ore body.

This time the problem had to be approached on a sound business basis because there was no longer a Defense Plant Corporation to pay the costs, whatever they might be, of a project considered essential during the time of war emergency. The results of the continuing research work done by the owners' engineers and consultants during the period 1943 to 1950 in the field of metallurgy and mining techniques proved invaluable in determining processes and equipment so



LEFT: After the face has been blasted the scattered broken ore is gathered into a compact pile with a front-end loader. RIGHT: The next step in the mining cycle is loading the broken ore with an electric powered Joy loader into shuttle cars, for transportation to the surface, later to the crusher station.

Equipment for Mine Development

that the project, as built, might represent a model of efficiency.

Geology and Ore Reserves

The White Pine ore body occurs in Upper Keweenawan sandstones, siltstones and shales and is restricted to two important mineralized horizons. The topmost horizon is called the upper shale; it averages 3 to 5 feet in thickness and has an average grade of over 25 pounds of copper per ton. Three to five feet below the upper shale and separated by sandstone lies the parting shale. This averages 7 to 8 feet in thickness and has an average grade of 24 pounds of copper per ton. All present mining development is being done in the parting shale.

Origin of the ore body is generally held to be syngenetic (sedimentary), although an epigenetic (hydrothermal) origin is advanced by some. Probable source of the copper was the copper-bearing Keweenawan lava flows and conglomerates to the northeast. Erosion of these ancient flows and eventual deposition of copper from solution under stagnant, swamp-like conditions produced the White Pine ore body.

Chalcocite (Cu_2S) is the chief copper mineral with minor occurrences of native copper and a little silver, bornite (Cu_2FeS_4) chalcopyrite ($CuFeS_2$), and covelite (CuS). The chalcocite occurs as fine disseminations and occasional pea-sized nodules throughout the shale, locally richer in particular bands and laminae.

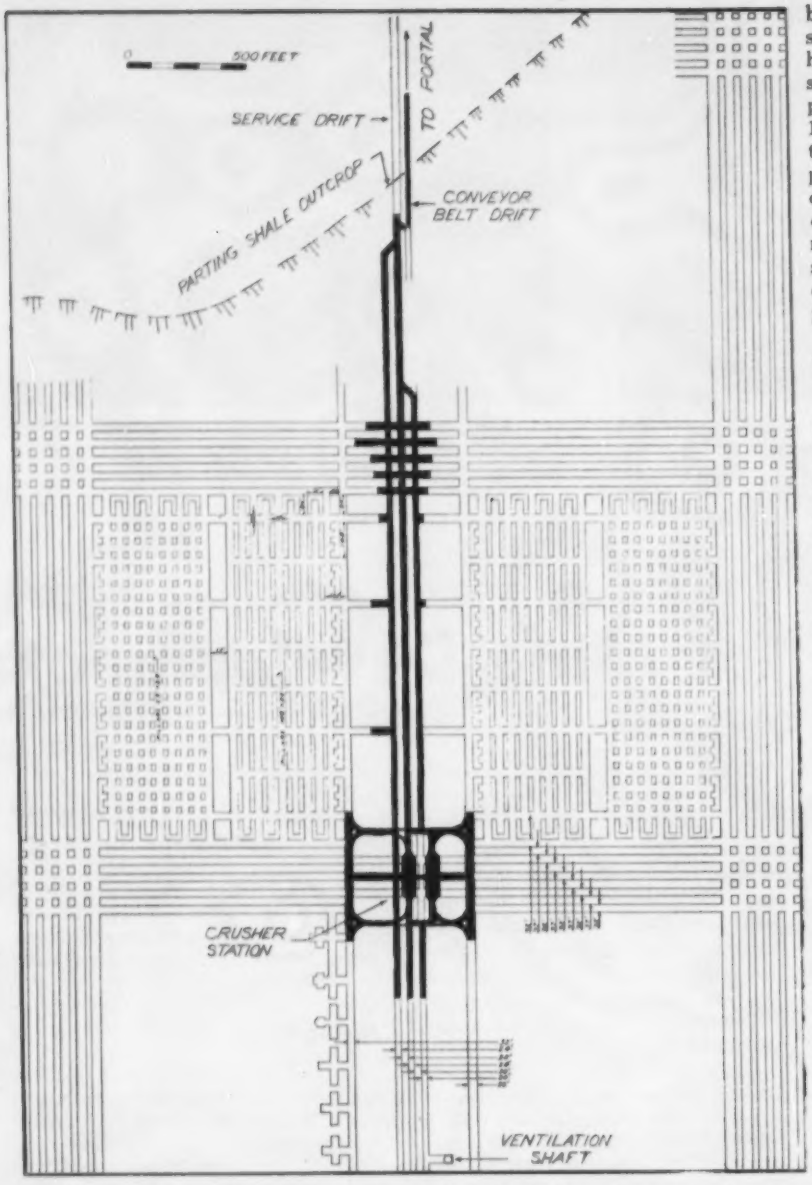
Regional tilting has warped the ore body into a gentle anticline. In the present 10-year mining plan dips of 5 to 7° will be encountered.

To date, 309,000,000 tons of ore averaging 1.1 percent copper have been developed over an area 3 by 5 miles.

Mining Plans

Mining will be by room and pillar methods, employing off-track equipment. Present plans call for mining only the parting shale and about one foot of the lower sandstone. This will be a thickness of from about 8 to 10 feet, and to the present date includes about 150,000,000 tons of

LEFT TO RIGHT: Harold B. Ewoldt, vice president and project manager; Stanley H. Cohlmeyer, assistant project manager; R. F. Moe, mine superintendent; C. A. Haberlen, chief mine engineer.



Part of the underground development map. Shaded area represents work completed up to April 1, 1954.

ore averaging over 24 pounds of copper per ton. At the proposed mining rate of 12,500 tons of ore per day, this reserve alone would last nearly 40 years. A Diesel-powered diamond drill mounted on a truck will be used to drill vertical holes to test and obtain samples of the Upper Shale horizon as mining continues. Depending on the results obtained from this sampling, the mining plans may be changed to mine the Upper Sandstone and Upper Shale at the same time as the lower ore beds are mined.

Entry to the mine is through a 10 percent adit, concreted to bedrock, and consisting of two 12-foot roadways (entry and exit) and a 3-foot man-way. This adit extends to the change house, permitting the men to enter the mine without being subjected to the severe winter weather.

Mining is being carried out as shown on the mine development map. This plan provides maximum maneuverability and a large number of adjacent working faces. It prevents undue loss of time in moving equipment from one face to the next, and enables close supervision of men and equipment. As shown on the map, large pillars will be left between, and adjacent to, the main service drifts. Extraction in the first half of each block near the main service drifts is calculated as 62.49 percent. Pillars in this block will be 148 by 20 feet. Smaller pillars are then left, and a removal of 71.86 percent is estimated for the remainder of the block. Extraction in the other blocks farther away from the main haulage drifts and crusher station, where ground movement is of less concern, will be about 85 percent.

Work Now in Progress

The three main service drifts and the conveyor drift are now driven to the crusher station. These service drifts are 24 feet wide, two of them being 8 feet in height, and one, 12 feet. The reason for the extra height of one drift is to provide room for moving electrical substations and crusher equipment underground, as required. All other drifts will be 32 feet wide. The conveyor belt adit, 20 feet wide and 12 feet high, is being driven below the stoping level to the crusher station. This adit slopes at a grade of minus-16.58-percent from the surface to bedrock; from bedrock to the crusher station, it is being driven at a minus-11-percent grade..

Drilling in the mine is done with Joy and Rogers jumbos driven by air motors and mounting two 3½-inch drifters; two jumbos consisting of two Gardner-Denver drills mounted on HD-5 Allis-Chalmers tractors are used in the belt tunnel excavation. All holes are drilled with 1⅜-inch Carset bits. Experiments are being made with several types of cut and burn rounds to determine the best possible hole pattern. A burn round is being used in the 12-foot-high service drift, utilizing an air-powered, 8-inch rotary drill mounted on a 60-E Joy Diesel-electric, shuttle car to drill the burn. This drill, manufactured by Ka-Mo Tools, Inc., of Cicero, Illinois, drills an 8-inch hole 14 feet deep in 20 to 30 minutes. Tungsten carbide chippers and cutters are used on the 8-inch bit. Results are much more favorable than were expected, and if it is decided to use the drill as a part of standard equipment, it will be mounted on a different (less expensive) unit.

Blasting is done electrically, both milli-second and regular delays being used with Atlas 60 percent semi-gelatin and 30 percent ammonia nitrate explosives.

Broken ore is loaded with Joy loaders into conveyor-dumping, shuttle-car trucks. The trucks now

being used are: three Joy, 12-ton Diesel-electric; three Le Tourneau, 18-ton Diesel-electric; three Dart, 18-ton Diesels; and three Joy 70EL 18-ton shuttle cars.

Belt tunnel haulage is accomlished by the use of Koehring Dumptors. Mine ore is now trucked to a stock pile near the mill until the underground crushing station and conveyor belts are installed (see development map for location of the crushing station and conveyor belt).

Some roof bolting is being done, especially in the conveyor belt adit now being driven in the lower sandstone. Drilling of the holes and installing of the bolts are done from the bucket of an Allis-Chalmers front-end loader. Expansion shell bolts of ¾-inch diameter and 4 to 5 inches in length are used.

Crushing Station

When the crushing station is completed, trucks will dump ore onto one of two tapered grizzlies. It then drops to a Stephens-Adamson pan feeder which discharges into one of two Rogers 32- by 40-inch jaw crushers. The minus-8-inch ore from the jaw crushers then falls into two 2,500-ton surge bins which will be blasted out of rock. Four pan feeders will feed from these bins to a speed-up belt that discharges onto the two-flight, 54-inch conveyor belt system. Each of these belts is driven with three 250 horsepower motors at a speed of 450 feet per minute. Maximum carrying capacity of the 54-inch conveyor belt is 2,400 tons per hour.

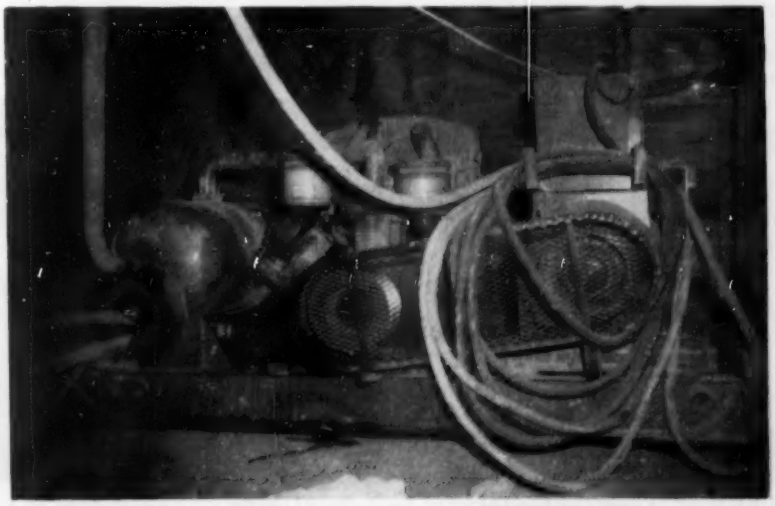
Ventilation

Fresh air (preheated during the winter months) is supplied with an 8-foot Jeffrey Junior Aerodyne fan forcing air down the adit which is partitioned with brattice. Fresh air flows down to the foot of the adit, where booster fans deliver it to working faces. Mine exhaust air flows up the exit side of the adit.

Additional air will soon be supplied with a 300,000 cubic foot per minute Joy Axivane fan. A 24-inch pilot hole—335 feet deep (see map for location)—has already been drilled by J. D. Judd & Son, churn drilling contractors from Shullsburg, Wisconsin. Development is expected to reach this ventilation hole about the first of May 1954; it will then be sunk on from the surface and enlarged to a diameter of 15 feet.

A drift round drilled out, now waiting to be loaded and blasted. All blasting is done electrically using both milli-second and regular delays.

Looking down one of the service drifts being driven towards the crusher station. Ore is hauled up these drifts to the surface in shuttle cars.



One of the portable compressors, this one is a 350 cubic foot per minute Jaeger and supplies compressed air for one jumbo (two drills).

LEFT: The roof of a freshly blasted face shows why roof bolting is necessary. RIGHT: Matt Ahola standing in the bucket of a front-end loader and putting the nut on a roof bolt with a pneumatic wrench.

Mine air will then be exhausted through this shaft.

Compressed Air

Compressed air is supplied with portable, or semi-portable, electric-powered compressors ranging in size from 360 to 837 cubic feet per minute. A 360-cubic feet per minute compressor is used to operate one jumbo (two drills) and the 837-cubic feet per minute size is used to supply air for two jumbos. By supplying air in this manner, long, large, costly air lines requiring continuous maintenance are eliminated. Transmission loss is of no concern and air can be quickly delivered to any part of the mine where it is needed. This flexible system practically does away with all the common headaches encountered in supplying compressed air.

Power

Power at 13,800 volts alternating current is brought into the mine to a substation. From here it is carried to diffeent parts of the mine at 4,-160 volts, where other portable transformers reduce it to 440 volts for operating use. This method again provides a very flexible and economical way of supplying power wherever it is needed.

Maintenance and Servicing

Maintenance and servicing of the mine equipment such as fueling, lubrication, and minor repairs are done with specially built Dart Diesel trucks. Mine roads are maintained with a Pettibone-Mulliken road grader.

Mining Cycle

When full-scale mining operations are under way, mining will be done by individual units. Two units comprise a division. Each unit will contain men and equipment for a complete mining cycle. This organization is designed to produce the most efficient and flexible mining system. At the present time, it is estimated that seven divisions will be needed to produce the 12,500 tons of ore required daily. Actual manpower requirements are now being worked out with regard to supervisory and hourly employees necessary to maintain efficient operations. The mining department will be comprised of three basic sections—production, maintenance and engineering—with each department reporting to the office of the mine superintendent. In the pursuit of normal production requirements, operational requests are accomplished between sections directly—other matters require approval of the mine superintendent or his superiors.

LEFT: Leo Kauss (left) and Henery Autio (right) changing the tungsten carbide fingers on the 8-inch auger bit. RIGHT: Collaring a hole with the rotary auger drill, which drills an 8-inch hole 14 feet deep in 20 to 30 minutes. This hole is left unloaded to provide a space for the rest of the round to break to.

View of the mill, showing the end at which the tailing and ore is stockpiled before being treated.

New Market For Tungsten Ores Is Provided By HM&S, A Successful Small Custom Mill

The HM&S milling company of Salt Lake City, Utah is now custom milling tungsten ore. Ore is concentrated by flotation to produce approximately a 10 percent WO_3 concentrate which is then sold to The Salt Lake Tungsten Company[1] for further refining.

The HM&S Company was organized in 1950 to purchase and mill a Metals Reserve Company stockpile of tungsten ore in Salt Lake City which remained untreated after the World War II. Metals Reserve refinery was dismantled at the war's end. HM&S is equally owned by J. H. Heginbothan, president; F. T. Mathews, vice president; and W. M. Story, secretary and treasurer, all of Salt Lake City.

Retreat Tailing

In March 1950 construction began on an 80-ton gravity flotation mill near the city limits of Salt Lake City. In August 1953 the last of the former Metals Reserve stockpile (some 30,000 tons) had been processed to yield a 65 percent WO_3 concentrate. With the construction of The Salt Lake Tungsten Company Refinery it was found that by producing a 10 percent WO_3 concentrate and selling this concentrate to the refinery for further treatment the tailing pile from the HM&S mill could be retreated at a profit. In August 1953, concentration of this tailing averaging 0.32 percent WO_3 began. HM&S also began to mill custom tungsten ore at this time.

[1] A new tungsten oxide refinery in Salt Lake City which began production in November 1953.

Custom Milling

Before any custom ore is purchased by HM&S, metallurgical tests are run by Salt Lake Tungsten to determine whether the ore lends itself to HM&S's milling process and to Salt Lake Tungsten's refining methods. If it does (as almost always is the case), HM&S guarantees the customer a recovery of 80 percent of the WO_3 contained in his ore.

Custom ore to be treated is first sent to the Utah Ore Sampling Company, an independent sampler at Murray, Utah. Here it is weighed, crushed to the desired size, sampled, and assayed. Payment for the ore is then made to the customer on these tonnages and assays.

The crushed and sampled ore is then stockpiled near one end of the mill. Tailing to be treated is loaded and hauled with a 4-cubic yard scraper pulled with a D4-Caterpillar tractor to an area also near this end of the mill.

Mill Circuit

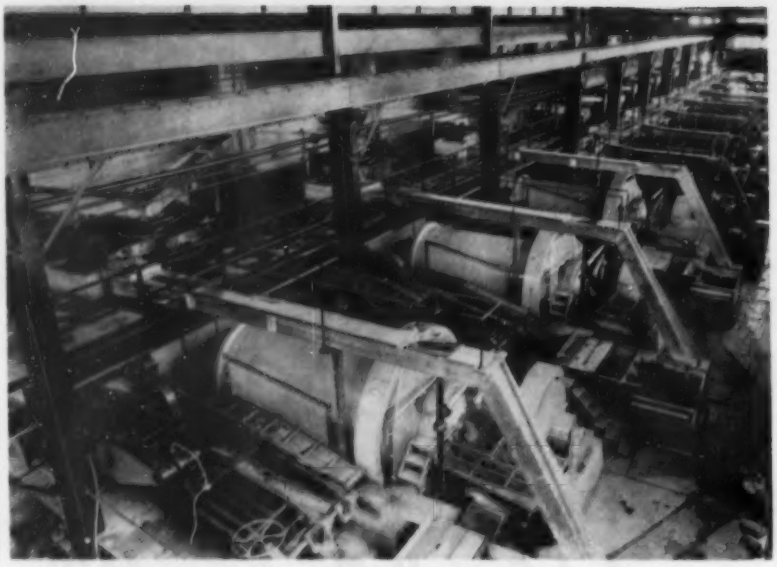
Ore or tailing, which ever is being treated, is then scraped from the stockpile with a double drum hoist scraper to a small bin in the mill. From this bin the material drops onto a 16-inch conveyor belt that delivers it to a 6-foot by 22-inch Hardinge ball mill in closed circuit with a 52-inch by 20-foot rake classifier.

Ore is ground in the ball mill to minus-65-mesh. Classifier overflow is transferred with a 2-inch Wilfley pump to a 4-by 5-foot conditioner built by HM&S, underflow is returned to the ball mill. Pulp from the conditioner flows through two 27-inch Denver cells used as roughers. Underflow from these cells goes to the scavengers which consist of three 27-inch Denver cells and one 48-inch Fagergren cell. Underflow from the Fagergen cell is tailing. Froth from the scavenger cells is returned with a 2-inch Wilfley pump to the conditioner. Froth from the rougher cells enters a 20-inch Denver cell used as a primary cleaner. Underflow from this cell is returned to the rougher circuit. Froth from the primary cleaner goes to a recleaner, another 20-inch Denver cell. Recleaner underflow is also returned to the rougher circuit; froth from the recleaner is concentrate.

Flotation tailing flows to a Wilfley table, used only as a pilot table for the flotation operator. Concentrate from this table is returned to the ball mill. Tailing from the table is pumped with a 2-inch Hydroseal to the tailing pond.

Froth (concentrate) from the recleaner is tabled on a 3-by 6-foot Deister table. Here a concentrate averaging higher than 65 percent

(*Continued on page* 63)



BEFORE MODERNIZATION Homestake's South Mill looked like this with 180 stamps, 10 rod mills, and 10 classifiers. Then, as today, 4,000 tons are milled per day. Summary of old operation is at right.

THE OLD PLANT

CRUSHERS

Four 8K gyratories
Four 7-foot Symons standard cones

GRINDING EQUIPMENT

180 Stamps
10 Rod mills
Seven, 5- by 10-foot
Three, 6- by 12-foot

4 Ball mills (Regrind 50% tonnage)
Four, 5- by 14-foot

4 Pebble mills (Regrind)
Four, 5- by 14-foot

FINENESS OF GRIND

All minus-80-mesh,
65 percent minus-200-mesh

POWER INPUT

Crushing:	0.75 kwh
Stamping:	2.50 kwh
Rod milling:	5.0 kwh
Regrinding:	3.0 kwh
Total	11.25 kwh

STEEL CONSUMPTION

Rods: 12 pounds per ton,
0.24 pounds per kwh

Balls: (Chill cast)
1.05 pounds per ton,
0.35 pounds per kwh

Homestake Rebuilds South Mill

By Nathaniel Herz
Chief Metallurgist
Homestake Mining Company
Lead, South Dakota

This article describes the development of ore grinding by the Homestake Mining Company, Lead, South Dakota, during its 76 years of operation from 1878 to the present. Over 82,000,000 tons of ore have been milled, with production of gold amounting to more than 21,000,000 ounces (worth over $750,000,000 at the current mint price of $35.00 per ounce).—Ed.

The Homestake Mining Company has completed remodeling and rebuilding of its crushing plants, and grinding and classification circuits to save both labor and materials. While the actual rebuilding has only recently been completed, it is the culmination of long-range planning by management. This planning started during World War II while Homestake and other gold mines were closed by government edict. The management had the foresight to anticipate the inflationary post-war period and the necessity for cutting costs.

Therefore, as soon as practicable, studies were made of all phases of ore treatment, including crushing, grinding, and cyanidation. *The only item that was considered certain at the start and was never altered was the idea that stamps must be eliminated, largely because of greatly increased labor cost.* Many flow sheets of crushing and grinding were drawn up and costs estimated; machines were operated under varying conditions with power measurements and screen analyses of products, and a pilot plant was operated for several years to determine possibilities of cyanidation by agitation instead of separate sand leaching and slime treatment; grinding in cyanide solution was investigated; recovery of the coarser gold by mineral jig was tried in both solution grinding and water grinding; fineness of grind ranging from 65 to over 90 percent minus-200-mesh was investigated.

The final result of all this, with due consideration given to existing buildings, equipment and saving in capital expenditure by using what was suitable was the decision to remodel the crushing plants first so as to deliver their product through ½-inch slot screens to the mill. This was to be followed by almost complete alteration of the mill, with only three old machines kept in service, but continuing grinding in water with amalgamation. Cyanidation remains essentially as it was, except for a program now under way of some modernization or replacement of outmoded equipment.

Free Gold In Schists

The Homestake ore body occurs in schist of pre-Cambrian age in what is locally called the Homestake formation. This was originally an iron-bearing carbonate rock (mostly sideroplesite) which has been greatly folded and locally largely converted to chlorite, cummingtonite (a ferrous-magnesium hornblende), and other minerals, with addition of quartz, iron sulphides (pyrrhotite, pyrite and arsenopyrite), and gold. Average ore contains about 0.40 ounce gold per ton, 8 per cent of sulphides (mostly pyrrhotite), 55 per cent silica (nearly half this in silicates), some carbonates, and other minerals in minor amounts. About 70 per cent of the gold is recovered by amalgamation and there is no evidence of the existence of any gold not in the free state. Gold particles are usually very small; when some are visible to the eye, a microscopic examination shows many more minute particles. There are enough larger flakes to make very desirable the quick recovery of as much as

THE NEW PLANT

CRUSHERS

Two 30-inch gyratories
Two 7-foot Symons standard cones
Two 7-foot Symons short head cones

GRINDING EQUIPMENT

No stamps
3 Rod mills
Three, 6- by 12-foot
3 Ball mills
Three, 9- by 11-foot

FINENESS OF GRIND

98 percent minus-80-mesh,
66 percent minus-200-mesh

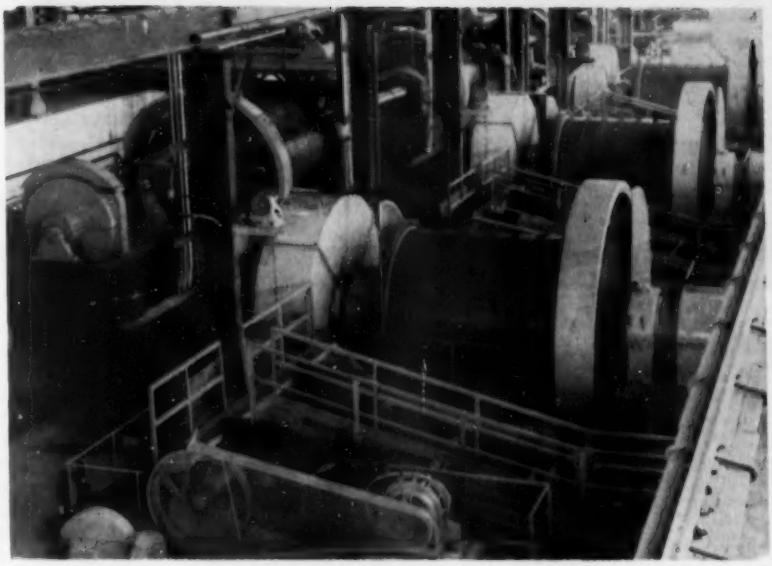
POWER INPUT

Crushing:	1.6 kwh
Rod milling:	2.7 kwh
Ball milling:	4.7 kwh
Total	9.0 kwh

STEEL CONSUMPTION

Rods: 0.64 pounds per ton,
0.24 pounds per kwh

Balls: (Cast iron)
1.8 pounds per ton,
0.36 pounds per kwh
(Steel balls)
1.17 pounds per ton,
0.25 pounds per kwh



TODAY GRINDING is done by these three open-circuit rod mills followed by three ball mills in closed circuit with classifiers. Data concerning crushing and grinding in the modernized plants is at left.

To Save Manpower and Horsepower

possible by amalgamation. Particles of gold over an ounce in weight are practically unknown.

Milling Started 1878

The Homestake was discovered in 1876 by Moses and Fred Manuel, who followed placer showings upstream to locate their source. In the next few months the Manuels, together with Hank Harney who owned a nearby claim, recovered about $5,000.00 from rich ore ground by an arrastra. The next year the Homestake claim was optioned and then bought by George Hearst of San Francisco, California, J. B. Haggin, and Lloyd Tevis who incorporated the Homestake Mining Company on November 5, 1877 and almost immediately purchased an 80 stamp mill. There was some production in May and June of 1878 from ore ground by arrastra, and in July of that year the first stamp mill was in operation; all the machinery, including boilers and engine, was brought the last 270 miles to Lead by ox cart over pioneer trails and was in operation eight months after the company was formed. Early results were so good that within a few months a second mill of 120 stamps was ordered and it was in use by September 1879.

These first mills were of California design, with falling weight of about 700 pounds; until 1890 there was no increase in number of stamps. A foundry was built to make cast iron parts for the mills, and over a period of years changes in design resulted in the Homestake stamp mortar; this was narrower from front to back than the California type, with a slightly higher discharge. The narrower mortar gave increased capacity, while the higher discharge improved gold recovery by inside amalgamation as well as by finer crushing; falling weight was also increased gradually to 1,000 pounds.

1,000 Stamps in 1904

The years from 1890 to 1904 constituted a period of expansion. Two additions to each mill during eight years doubled the number of stamps; in the next four years four mills totalling 500 stamps were acquired by consolidation. In 1904 another 100 stamps were added to one of these, making the total of 1,000 stamps of 1,000 pounds in six mills, crushing about 4,000 tons daily. Preliminary crushing was originally done by jaw crushers and later by No. 6 gyratories with feed openings of about 11 inches, requiring hand sledging of many of the larger pieces of ore.

Gold recovery prior to 1901 was 72 per cent, all by amalgamation; most of the amalgam was caught on chuck plates inside the stamp mortars below the screens. Beyond the apron plates below the mortars there were two, or in some mills three, additional plates to increase the recovery. For a few years a small quantity of low-grade concentrate was recovered and sold to a local smelter in Deadwood.

In 1901 cyanidation of the sand fraction of the tailing from amalgamation was started, followed by treatment of the slime in another cyanidation plant in 1906. The production and selling of concentrate was stopped in 1901, but regrinding of a small amount of the heavier sand roughly separated by cones was done. Over a period of about 15 years the amount reground was gradually increased until five pebble mills were in use. At the same time the weight of some stamps was increased from 1,000 to 1,100 pounds, some slightly coarser screens were used, and one mill of 100

Nathaniel Herz was born in New Haven, Connecticut where he attended Yale University, graduating in 1908. He then did two years graduate work, receiving the degree of Engineer of Mines in 1910. After a year of teaching at Yale, he went to Homestake Mining Company in 1911 as chemist in the Metallurgical Department, and has been with Homestake since then with the exception of a period in the Research Division of the Chemical Warfare Service during World War I. He became Chief Chemist and Assistant Chief Metallurgist of Homestake in 1929, and has been Chief Metallurgist since the latter part of 1942. He is a member of AIME, M&MSA, and Sigma Xi.

stamps was abandoned with no reduction in total milling capacity.

Two Stage Crushing Started

During the latter part of this same period two-stage crushing prior to stamping began. The first installation added 8 K gyratory crushers (with 19-inch feed opening) ahead of the old No. 6 gyratories. The primary machines were set at 4½ inches and the secondaries at 2 inches. There were duplicate installations of one primary and two secondary crushers at this plant, one set being able to crush as much as could be hoisted (about 2,000 tons per shift) with the other set in reserve. This was soon followed by the installation of 36- by 48-inch jaw crushers underground at the other main shaft, with No. 6 gyratories set to 2½ inches on the surface. Some years later these gyratory crushers were replaced by 7-foot standard Symons cone crushers set to 1¾ inches. One of these easily crushed the 2,000 tons hoisted in a shift.

About the time of World War I it became evident that within a few years all of the old stamp mills must be abandoned due to surface subsidence caused by the early mining operations which had depended too greatly upon timber with insufficient back-filling. This led to the erection of the present mill building in 1921 and 1922, with some radical departures from former practice. South African gold mines had developed heavy stamps (up to 1,800 pounds) as the first stage, followed by regrinding in pebble mills using hard ore as pebbles, while in the United States the popular trend was to ball milling, developed largely by the porphyry coppers.

Early Ball Mill Testing

A ball mill was purchased for testing and operated for several years with only moderate success. Due to the toughness of Homestake ore, the product of the crushing plants was not suitable ball mill feed; too many extremely coarse pieces appeared in the mill discharge and the circulating load was too heavy for good grinding or efficient classification. With over 40 years of stamping experience, plus a foundry, it was decided to use South African stamp practice followed by rod mills with a minor amount of regrinding by pebble mills. Rod mills were rather new at that time, but with grinding rods costing half as much as balls it seemed to be the proper choice and was never regretted.

Homestake's South Mill as originally built contained 120 stamps of 1,500 pounds-falling-weight located on two levels on a rather steep hillside. The stamps in two rows of 60 each were back-to-back with a gable-bottom ore bin between the rows; slope of the hill was such that the discharge from the upper row flowed by gravity to combine with that from the lower row of stamps. The stamp duty was about 15 tons per 24 hours or 1,800 tons per day for the entire mill. Six rod mills (5 feet in diameter by 10 feet long) were used in closed circuit with Dorr classifiers, with two pebble mills for regrinding. Stamp discharge was dewatered in six cones ahead of the rod mills; these cones also overflowed about 15 per cent of the finer portion of the ore. There was no amalgamation ahead of the rod mills as the coarse size of stamp product (screens were originally about 3/16-inch) made amalgamation impossible at that point.

The next 15 years saw the elimination of all the remaining old mills, with enlargement of the South Mill to handle the full Homestake tonnage of 4,000 tons per day. With more selective mining the ore grade improved, so somewhat finer grinding became profitable. Also, during this period, the old shafts and crushing plants were abandoned, being replaced by two new shafts with their crushing plants, consisting of two 8K gyratory crushers, each followed by a 7-foot standard Symons cone crusher, thus providing a spare crushing line at each shaft.

ALLIS-CHALMERS BALL MILLS are now used in the remodeled South Mill at Homestake. This is the drive side of one of the three 9- by 11-foot ball mills.

The Mill Before World War II

The mill now contained 180 stamps; the building was extended from a width of 176 feet to 252 feet, with the ore bin now 220 feet instead of 132 feet across the front. There were seven rod mills 5 by 10 feet and three larger ones, 6 feet in diameter by 12 feet long, all in closed circuit with Dorr classifiers. Stamp screens varied from about 5/8 to 1 inch opening.

Regrinding of about half the tonnage was done by four ball mills 5 feet in diameter and 14 feet long, and four pebble mills of the same size. The final product was practically all minus-80-mesh, with 65 per cent minus-200-mesh.

Power (motor input) to crushing and grinding machines without accessories, such as classifiers etc., was

about 11.25 kwh per ton, divided thus:

Crushing	0.75 kwh
Stamping	2.5
Rod Milling	5.0
Regrinding	3.0
Total	11.25

Grinding rod consumption was 1.2 pounds per ton or 0.24 pounds per kwh Ball consumption (chill cast) was 1.05 pounds per ton or 0.35 pounds per kwh.

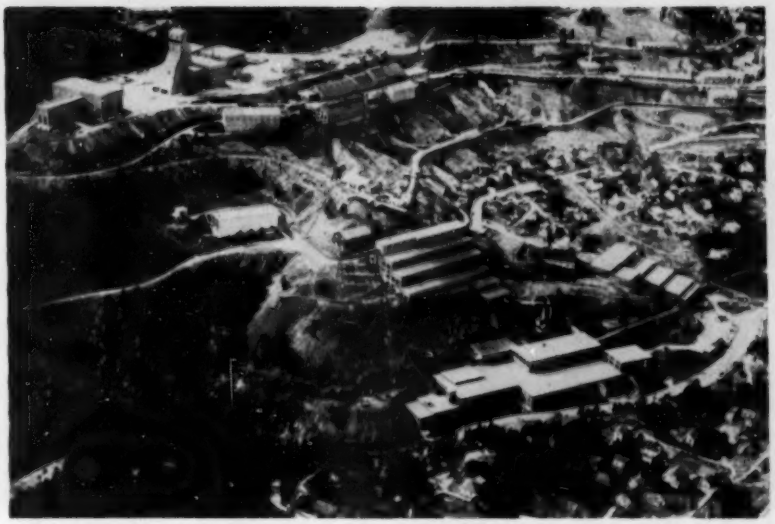
After War—Crushing Changes

Each crushing plant as rebuilt in 1951 and 1952 now has a primary gyratory crusher (Allis-Chalmers) with 30-inch feed opening, with a Ross chain ore feeder; the setting is about 4 inches. The product goes to a 7-foot standard Symons cone crusher set at 1⅛ inches. The cone discharge goes to Tyrock screens with ½- by 5-inch openings, with oversize going to a 7-foot Symons short head cone crusher set at 5/16 inch with its product going to the Tyrock screens, thus making a closed circuit. There are now no duplicate machines at either plant; two standard cone crushers were converted to the short head type. Crushing power was about doubled, but cost increased less than that amount. A little more labor is required, but there is considerable saving in materials and cost of making replacements. The two largest items in these savings are the change from cast iron mantles to manganese steel in the gyratory crushers and the use of short head cone crushers for a large part of the work formerly done by stamps.

Now Three Grinding Circuits

At the mill there are now three identical units, each with a capacity of about 1,350 tons per day, one of which will be described. This unit takes ore from a bin width of 44 feet through four chutes, each with a gate and a 24- by 48-inch Jeffrey-Traylor electric vibrating pan feeder, discharging to a 24-inch belt conveyor across the face of this bin section. Two of these feeders are manually controlled and two are automatically regulated by the weigher to be described later.

At all times one feeder of each control type is used, alternating them in order to draw ore more uniformly and to clean off a certain amount of ore that packs in the pans. The belt conveyor, in turn, feeds its ore into the hopper of a Transportoweigher which, in turn, discharges into the rod mill feed spout. The Transportoweigher is a packaged unit consisting of a 24-inch belt conveyor, with weigher and a choice of controllers, indicators, totalizers etc. As used in this mill, there is a control panel on the mill operating floor for the heavy equipment and the Transportoweigher; on this panel there is a tonnage rate indicator, a 24-hour chart recorder, a tonnage totalizer, and two push buttons to raise or lower the rate setting.



HOMESTAKE, largest gold mine in the United States. The Yates shaft is at upper left, shops and foundry upper center, South Mill in the center, and the sand leaching plant at lower right.

Marcy Rod Mills

The rod mill is a 6- by 12-foot Marcy, moved from its former location and now operated in open circuit. The feed trunnion is rather small in diameter for the tonnage and size of feed, but by trial and error a satisfactory spout has been developed, carrying the ore and water into the mill. The rod mill uses Lorain rolled plate liners with hardened lifter bars; rods are 3½ inches in diameter, of C 1095 steel. The mill discharge goes to the ball mill, a 9- by 11-foot Allis-Chalmers mill equipped with a combination drum and double scoop feeder. Liners are Lorain similar to those used in the rod mill, with end liners of molychrome steel or Ni-Hard. Ball additions are of 1½- to 2-inch size. The ball mill discharge flows to a Dorr HX classifier 16 feet wide with 30-foot rakes; the return sands are conveyed to the scoop box by a 36-inch diameter spiral.

The rod mill is driven by a 200-horsepower, low-speed synchronous motor through a single reduction herringbone gear drive, while the ball mill is driven by a 450-horsepower, 1,200 revolutions per minute wound rotor induction motor through a Falk speed reducer and a single helical pinion and gear.

Amalgamate In Grinding Units

Amalgamation starts in the rod mill by feeding about one third of the required quicksilver with the ore; the balance goes to the ball mill. An attempt to collect amalgam from the rod mill discharge was not too successful, but a small amount is recovered periodically from a sump at the mill discharge. The major production comes from an amalgamator of the Clark-Todd type through which the ball mill discharge flows on its way to the classifier.

Each unit is supplied with water from its own steady head tank with a Venturi meter in the pipe connected to a flow indicator, 24-hour chart, and totalizer on the mill operating floor. Branch lines leading to the various points of water addition are provided with rate-of-flow indicating instruments so proper amounts are used where needed. For good amalgamation water jets at moderately high pressure must be used, so a portion of the flow goes through a booster pump in each unit for this purpose.

The first unit was placed in service in February 1953, with Homestake manufactured cast balls, the same as previously used for many years. The second unit went into service in July and the third in November, using steel balls of two dif-

(*Continued on page* 63)

DESLIMING AND DEWATERING of iron ore tailings is an important use for DorrClones. The five 24-inch rubber-lined units pictured here are in operation in a plant on the Lake Superior Iron Range.

The Current Status of Cyclones As A New Classification Tool

With Emphasis on Design and Operational Variables, Classification Cost Comparisons, and Many Successes Due to Capacity and Simplicity

By A. J. Fischer
Assistant to the president in charge of DorrClone coordination, The Dorr Company, Engineers; and
R. D. Forger
Technical Assistant, The Dorr Company, Engineers

In recent years interest has increased sharply in the use of wet cyclones as a new classification tool. Numerous papers have been delivered before various technical societies discussing both the theoretical and practical aspects of these units. The technical press has also contributed to the general knowledge with details of various applications in widespread fields.

One of the latest of these was the article in the January 1954 issue of MINING WORLD by M. J. Dennehy titled "Will Cyclones Replace Mechanical Classifiers?" He describes the application of the wet cyclone as applied to both primary and secondary grinding circuits in gold ore treatment plants. Reported as being successful from both the operating and economic standpoints, the results reflect considerable credit on the ingenuity of those responsible. As was noted, however, this application was slow to develop as compared with many others in related fields.

Experience has borne out the need for caution in applying the DorrClone* to new areas despite demonstrated success in seemingly identical or very similar applications. Since the beginning of our initial development work on this unit in 1948, units ranging from 24 inches down to 10 millimeters in diameter have been marketed for the classification of more than 55 materials in the chemical, metallurgical, and nonmetallics fields. During this period standard DorrClone design and materials of construction have been modified continuously—and in some cases radically—to meet the physical and operating requirements of new applications.

Five Variables In Cone Design

Five principal physical variables affect cyclone operation and results. These are cone angle and the diameters of the feed entrance, vortex finder, apex or discharge opening and the cyclone itself. Extensive research in the early stages of DorrClone development proved the feasibility of standardizing cone angle except in relatively rare and exceptional cases. The most important physical variables affecting mesh of separation have been found to be cyclone diameter and the sizes of the feed entrance and vortex finder. In general, the larger the diameter of the cyclone or its fittings, the coarser the separation. However, with oversize fittings the sharpness of the separation will suffer, and if the fittings are too small the separation will again become coarse. The primary function of varying the diameter of the apex opening is control of the nature and dilution of the underflow.

Dilution Factor In Separation

In addition to these physical variables of the cyclone itself, there are other factors which, in certain cases, have proven critical in terms of successful application. For instance, mesh of separation is strongly influenced by the dilution of the feed

* DorrClone and Vactrol are registered trademarks of The Dorr Company.

slurry and the size distribution of the solids in the pulp. As the percent solids in the feed is increased or as the solids become coarser the separation becomes coarser. The effect of dilution is illustrated in Table No. I in which the overflow dilution by volume is defined as the volume of liquid divided by the volume of solids. The feed to this 12-inch DorrClone was 95 percent minus-325-mesh dolomite.

Table No. I
The Effect of Dilution on DorrClone Separation

Overflow Dilution by Volume	*Overflow Percent Solids*	*Separation, Microns*
4	42	Coarser than 147
5	37	60
6	32	43
10	22	36
20	13	32
Very High	Low	29

In addition, the viscosity or plasticity of the feed will affect cyclone operation to a serious degree in certain applications. Separations on plastic pulps will normally be at least one mesh size coarser than on non-plastic pulps. It is necessary to dilute plastic pulps or to increase the operating pressure as high as 70 pounds per square inch to produce results equivalent to those obtained from treating a non-plastic slurry.

Feed Pressure Variations

Feed pressures are yet another variable. To date it has been found advisable to operate most cyclones at feed pressures varying from 10 to 40 pounds per square inch in order to produce ideal results. Recently, however, acceptable products have been obtaind in some instances at pressures as low as 5 pounds per square inch. At higher pressures, particularly in handling abrasive materials, the wear factor may be critical. As an indication of the problems encountered, experiments have been carried out with DorrClones of hardened steel, heat-treated Meehanite, and Ni-Hard. Cone liners of two types of ceramically bonded, abrasion resistant material, Linatex, and a great many combinations of both natural and synthetic rubber have also been thoroughly tested. The rubber has been both vulcanized in place and of the removable molded type.

Costs and How Figured

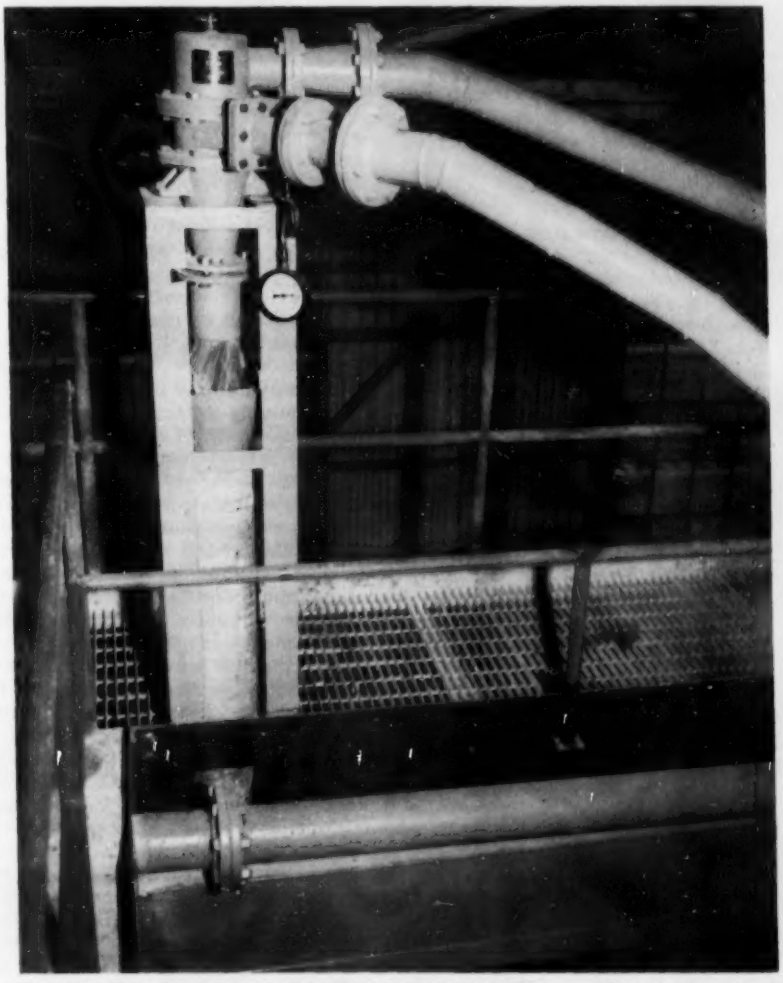
For the potential user, one of the most attractive features of the cyclone as compared with conventional classifiers is its apparent low cost. However, to properly evaluate the wet cyclone versus the mechanical classifier in any operation an accurate analysis of the initial, operating, and maintenance costs is essential. The cost of the cyclone itself is but a relatively small part of the initial installed cost in most instances. At existing plants a suitable pump may be available to handle the feed slurry to the cyclone. Although the cost of this pump may have been charged to a previous operation, to present a true picture this debit should be included as part of initial installed cost. With the use of larger cyclones the cost of pump and piping often approaches 70 percent of the total cost of the installation.

With reasonable maintenance a mechanical classifier may be expected to last 20 or more years. The cyclone with its inherent wear problem cannot be expected to have as long a life. It is thus necessary to multiply the cyclone capital investment figure by a corresponding factor when comparing it with mechanical classifier capital cost. In most applications the maintenance for the cyclone itself is reasonable, but pump maintenance costs are usually substantial. Similarly, cyclone operating costs tend to be high because of greater power requirements as compared with conventional units.

In short, the installation of a wet cyclone at a substantially reduced initial cost and with reduced area requirements will mean increased operating and maintenance costs over conventional mechanical classifiers. Just which is more economically sound depends upon the individual operation.

Operational Variations

Extensive development work and the results from numerous actual commercial installations have proven the practicality of controlling the



MINIMUM OF VALUABLE FLOOR SPACE is needed for cyclone classifiers. This 6-inch DorrClone is used in the grinding circuit of a cement mill. Grinding capacity has been slightly increased by its use.

four physical variables of cyclone operation previously enumerated either by design or by varying the interchangeable fittings. However, the so-called operational variables such as viscosity, operating pressure, and wear differ for each application. Their effect upon actual operation is usually unknown until the completion of pilot plant tests or installation on a commercial scale.

The case of a cement manufacturer is typical of the critical effect of plasticity or viscosity on operating results. Cement mill slurry usually contains about 65 percent solids and can be satisfactorily classified in a DorrClone at 20 pounds per square inch. At this particular plant the slurry was so plastic that 40 pounds per square inch was needed to produce effective classification at 55 to 60 percent solids. Experimental work was initiated during the late summer of 1953 employing a 6-inch cyclone to close the tube mill grinding circuit. After three weeks of extensive testing, results showed that this arrangement produced moderate increases in grinding capacity over open circuit operation as summarized in Table No. II. The increase in capacity has been based on both the conventional percent passing 200 mesh and the percent passing 100 mesh which may also prove to be an acceptable figure.

An attempt was made early this year to reproduce these results. However, due to a problem encountered with the raw mill feed launder the percent solids in these tests ran about 2 percent higher. When the results indicated that the increase in capacity was not as substantial as in the earlier tests, a program was carried out to investigate the effect of dilution on capacity.

It was found that a 3 percent decrease in the percent solids in the slurry was necessary to duplicate the results of previous tests based on the percentage passing 100 mesh. At the same solids content only a 10 percent increase in capacity was possible as compared to the previous 16 percent increase based on the percentage passing 200 mesh. This 16 percent increase was never attained in the second series of tests, and viscosity was definitely established as the critical factor.

Wear—Most Critical Factor

A secondary problem in these tests was wear. The original tests were run in a standard 6-inch, rubber-lined DorrClone. Because of some evidence of wear after the first three weeks of operation a two-month test was conducted to evaluate and establish the seriousness of the problem. At the end of this period, during which the cyclone was operated 16 hours a day, the rubber lining in the lower two inches of the cone and the apex tail piece showed considerable wear. It was estimated that the worn sections would have to be replaced every three or four months. To economically minimize the effect of wear in this, and other similar applications, a new design has since been developed.

Table No. II
Results of Cement Rock Grinding Tests

Circuit	*Open*	*Closed*	*Closed*
Capacity, Tons Per Hour	13.0	15.1	15.9
Percent increased capacity		16	22
Percent minus-100-mesh	97.8	98.1	97.8
Percent minus-200-mesh	90.5	90.5	89.4

In a great many applications, wear is the most critical factor encountered and the use of cyclones for fine coal recovery and desliming is a prime example. In late 1951 a standard 6-inch DorrClone with a rubber-lined cone and hardened Meehanite feed chamber was installed for test purposes at an East Coast washing plant. After approximately 150 hours of operation the unit was taken off the line and inspected. Both rubber apex valve and rubber lining in the lower cone were completely destroyed and a drastic revision in the materials of construction was indicated.

A specially designed unit was then equipped with a liner of ceramically bonded abrasion resistant material and put on the line. Handling a material containing 20 percent plus-35-mesh and 60 percent minus-325-mesh at a rate of 100 gallons per minute, this cyclone was operated for 2,300 hours at which time the test was terminated. Conical section and apex valve showed only negligible wear; in fact no change could be detected after the first 500 hours of operation. The feed pressure during this test was 40 pounds per square inch.

The complete success of this test prompted the application of an identical unit to an entirely different problem; the two-stage degritting of a southern clay. Twenty-two standard 6-inch DorrClones with rubber-lined cone and hardened Meehanite feed chamber were giving good operating results, but periodic examinations had shown wear to be a serious problem. In places the rubber was worn completely through and the abrasive fraction of the clay was attacking the cast iron shell.

The clay which contained but 10 to 12 percent plus-325-mesh material in the feed to the first stage attacked the ceramic liner of the new unit in only 75 hours of operation. The bonding material was badly eroded leaving the liner surface rough. Interestingly enough, the wear in the secondary cyclone was more severe than in the primary. Subsequently, other materials of construction were tested, but the rubber liner proved to be by far the most satisfactory. Ultimately the use of a special removable rubber-lined section was specified which lasts approximately five months and has eliminated a major portion of the wear problem.

Worst Wear To Date

The worst wear encountered to date occurred in a rubber-lined, 12-inch DorrClone dewatering iron ore tailings. Operating at 22 pounds per square inch on a very coarse feed, as shown in Table No. III, the rubber was completely destroyed and a small hole worn completely through the cast iron shell in only 220 hours.

The unit was repaired, relined, and put back in operation. This time signs of wear showed up after 60 hours. A new 24-inch unit was supplied in the belief that operation at a reduced pressure would decrease erosion. Operating at 13 to 15 pounds per square inch, this lining wore through after 96 hours. At this point it was clear that there was no economically sound answer to this particular wear problem and it was labeled a misapplication.

By way of contrast in the same field, a number of examples could be cited. At one washing plant on the Mesabi Range the results from a trial, rubber-lined, 24-inch DorrClone led to the installation of six units to deslime and dewater iron ore tailings. The operation is unique in that for two shifts the cyclones receive 65 percent minus-200-mesh classifier overflow from the main plant. During the third shift reclaimed tailings are deslimed prior to further beneficiation.

Closed Circuiting In Iron Mill

Extensive testing has just been completed at another iron ore plant using 12-inch, rubber-lined cyclones

Table No. III
Screen Analysis of Coarse Iron Ore Tailings

Mesh	*Percent Cumulative Plus*
6	7.7
10	35.1
20	55.3
35	68.6
48	79.9
65	82.0
150	85.0

with existing ball mills to close the grinding circuit. During this period results have compared favorably with those from mechanical classifiers, and ball mill horsepower requirements and ball consumption has been substantially reduced as compared with previous operation.

No Set Pattern For Copper

The copper industry is another instance where the problems of successfully applying the DorrClone have followed no set pattern. In one case, a 24-inch unit has operated for over 3,000 hours at 20 to 22 pounds per square inch without any indication of wear and no maintenance costs. Most important operating requisite here has been the maintenance of a constant underflow density which has been accomplished automatically with a Vactrol underflow controller. Plant data indicate a fluctuation of only 0.3 percent solids in the underflow during periods when feed solids ranged from 3 to 27 percent.

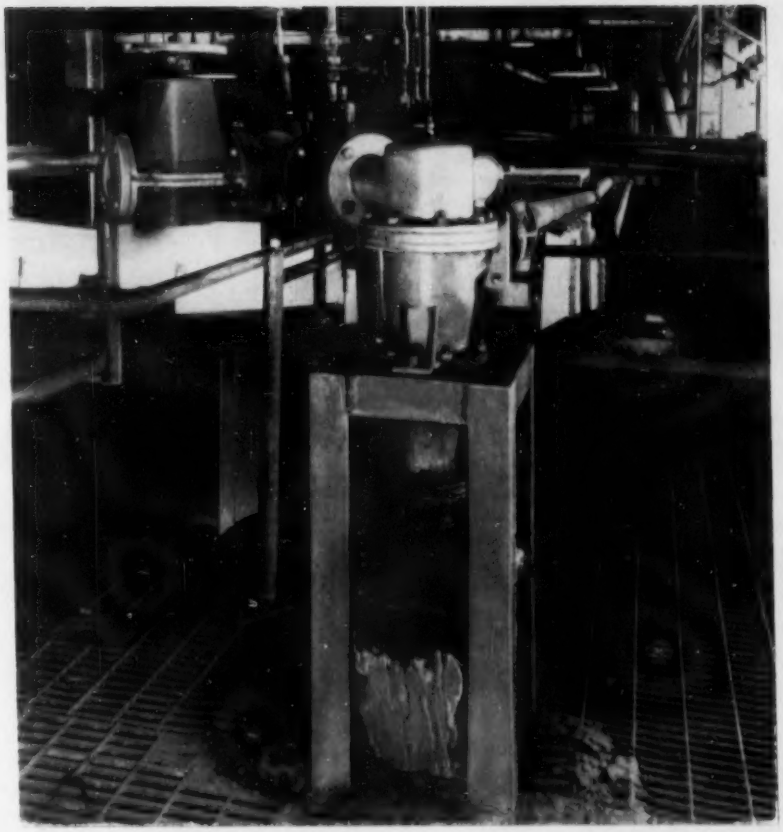
A second case in the same industry involved the need for increased classification capacity at a plant in which space was at a premium. A 24-inch, rubber-lined unit was installed replacing a bowl classifier which proved to be undersize when regrind circuit capacity was increased 30 percent by the addition of a second ball mill. Handling the entire tonnage the unit produces an overflow containing 77 to 80 percent minus-200-mesh material from feed with 18.9 percent plus-150-mesh and 37.4 percent plus-200-mesh material. A 50 percent reduction in mill horsepower was achieved using the wet cyclone because increased grinding efficiency permitted a reduction in ball load.

Operating with 50 percent solids in the feed and at only 5 pounds per square inch, operating and maintenance costs have averaged 83 percent higher than for the bowl classifier. Power costs were comparable, but pump maintenance alone was twice the total for the classifier.

Table No. IV
Cost Comparison of Bowl Desiltor and DorrClone at Limestone Plant

Item	*Bowl Desiltor*	*DorrClone*
Capital investment*	$24,000	$8,000
Annual operating costs		
Power (at 1¢ per horsepower hour)	320	1,400
Maintenance (estimated materials and labor)	200	800
Operating labor	negligible	negligible
Annual fixed charges (10 percent of invested capital per year)	2,400	800
TOTALS	$ 2,920	$3,000

*Capital investment includes; *Bowl Desiltor:* 26-foot bowl and 5-foot classifier with drives, erection including foundations, piping and 100-foot conveyor to carry product to stockpile. *DorrClone:* 12 inch; 4 inch sand pump with 40 horsepower motor, erection over stockpile, steel platform, piping and pump foundation and sump.



ABRASION-RESISTANT LININGS for cyclones have been the subject of much study. At an East Coast coal washing plant this 6-inch DorrClone's lining has shown only negligible wear after 2,300 operating hours

Costs Over Operating Life

As has been previously mentioned, an accurate cost evaluation is a necessity for the potential wet cyclone user. No two cases are ever exactly the same and often seemingly identical applications will prove radically different economically. To illustrate the point let's take a look at a sample problem and cost analysis involving the alternates of a conventional bowl-type classifier and a cyclone.

The problem is to recover and stockpile fine limestone for use as agstone from the minus-65-mesh tailings water at a limestone crushing and washing plant. A 50 to 60 micron separation will be required to recover 80 percent of the plus-325-mesh solids or about 60 percent of total solids. Feed will be approximately 500 gallons per minute at 6 percent solids or roughly 7½ tons per hour. Recovered product will average 4 to 4½ tons per hour.

Analysis shows that either a Dorrco Bowl Desiltor or DorrClone installation will produce the desired results and meet all specifications. Because of the inherent physical differences of the units, the necessary auxiliaries will differ somewhat, and the difference in capital, operating and maintenance costs will be marked as shown in Table No. IV.

On the basis of a 10 year write-off, overall costs would seem to be a standoff. However, at the end of the 10-year period the operating cost differential of roughly $1,700 per year favors the Bowl Desiltor, as does the longer life expectancy of conventional units as compared with cyclones. For this reason, the Bowl Desiltor installation is the more economically sound investment despite an initial capital cost three times as high as that for the alternate.

Many Successful Uses

There has been no attempt in this brief space to cover the successful applications of the DorrClone. Innumerable instances could be cited in which standard units performed without any operating or mainte-

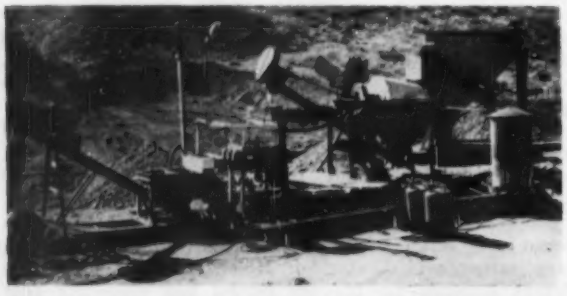
(*Continued on page* 65)

RECLAIM WATER AND RECOVER "FLOUR" GOLD BY NEW MACHINE

A process which saves "flour" gold has been successfully tested in a commercial-size operation near Las Vegas, Nevada, according to the inventor and his associates.

Peter L. Gregersen, Spokane, Washington, who spent 20 years developing the Gregersen concentrate classifier, says it will revive the gold mining industry. Even old tailings piles from placers can be re-worked profitably with the machine, he says.

A former precision machinist, he built a pilot plant in the backyard of his Spokane home and tested it on Idaho's Snake River sands. He claims to have recovered gold so fine it takes 1,500 pieces to make a penny weight. He took the pilot model to Alaska last year to test difficult-to-work placers.



Gregersen gold concentrate classifier in operation on placer material 40 miles southwest of Las Vegas, Nevada. Screened aggregate fed into hopper (right) is conveyed to the warm-water washing tank containing rotating trommel screens and nugget trap. Concentrate, collected in tank bottom, is chilled and elevated to amalgamator using "specially processed" mercury to save fine gold. Tailing and water drop into adjoining tank from where tailing is elevated to waste dump and water is pumped back into system for re-use.

For the large-scale test, equipment for treating up to 200 tons of placer gravel daily was assembled recently on leased Nevada placer ground having only a limited water supply. The test results were fully up to expectations, according to Leslie F. Williams, president of a closed corporation organized by Spokane business men to build and lease the machines on a royalty basis in the Pacific Northwest and Canada.

Key recovery medium is said to be specially processed mercury used to coat the amalgamation plates.

Warm water is used as the circulating agent. It is used over and over again, thus making the process practicable for desert areas. The water heating system also adds months of operation in cold climates.

Gravel is screened to one inch or smaller size and oversize eliminated. The screen undersize is then fed into a hopper and lifted by a conveyor system to the washing tank. The conveyor discharges into a warm-water spray containing a special solution.

Streams of water under pressure clean the gravel and move it on through rotating trommel screens partially submerged in the washing tank. During the washing process, nuggets larger than ⅛ inch in size are caught in a patented "nugget trap." Aggregate smaller than ⅛ inch, including fine gold and small nuggets, are dropped through the rotating trommel screens to the bottom of the tank.

There the concentrate is chilled and raised by a screw conveyor up an inclined pipe to the amalgamator. Water again is added as the concentrate is fed into the amalgamator. Water and tailing from the amalgamator drop into another tank where tailing is dewatered and conveyed to the dump while the water is pumped back into the system to be used again.

Gasoline or electric motors power the elevator, washing and trommel screen section, the amalgamator, and the pumping system. The water heating system can be handled in a number of ways. Gasoline consumption is about 10 gallons daily on a 50-ton machine.

A standard amalgamator, manufactured by Gibson Machine Company, San Francisco, is used on the test machine in Nevada. The size of the amalgamator desired determines the size of the other equipment and tonnage capacity.

The classifier is manufactured from Gregersen blueprints by Link-Belt Manufacturing Company in Los Angeles, California. The Gregersen unit is all the equipment needed for lode gold mining besides the ball or stamp mill, it is claimed.

Distributors are Gregersen Concentrate Classifier, Inc., care P. L. Gregersen, 1408 South Fifth, Las Vegas, Nevada and Gerco Company, 9 East Empire, Spokane, Washington.

Muriel Sibell Wolle Describes

BODIE, CALIFORNIA, JOINS THE GHOSTS

From a mineral belt in California 2½ miles long and three-quarters of a mile wide, and extending from Bodie Bluff on the north to Silver and Queen Bee Hills on the south, an estimated $70,000,000 worth of bullion has been produced. Yet today, sun-blistered and wind-swept Bodie stands neglected and almost completely deserted, high in the eastern foothills of the Sierra Nevada.

The camp lies on a barren flat devoid of trees 200 feet below Bodie Bluff, its stark, frame buildings rising out of the sagebrush. At the peak of its boom, with a population of 10,000, its mines produced $400,000 a month and its properties were worked by more than 30 companies.

Gold was known to exist in the region as early as 1857, when Mormon miners found "colors" near Mono Lake and worked their Dogtown Diggings. The Comstock excitement was the next to draw men across the Sierra Nevada. One route from the west was over Mono Pass, and among the first to push across it were William S. Body and his partner, E. S. Taylor.

These two continued east and climbed foothills where they discovered gold in 1859 in Taylor Gulch, on the east side of Silver Hill. Later in the season the men went to Monoville for supplies. On the way back they were caught in a snowstorm and before reaching their cabin, high on the range, Body became exhausted and was unable to go on. Taylor carried him as far as he could and then wrapped him in a blanket and left him. Struggling on to their cabin, Taylor got some food for Body and hurried back through the storm, but was unable to find the spot where he had left his partner. Body's body was discovered the next May (1860). Not long afterwards Taylor was killed by Indians. Other prospectors drifted in, and before long their scattered cabins became known as the camp of Bodie (named for William S. Body).

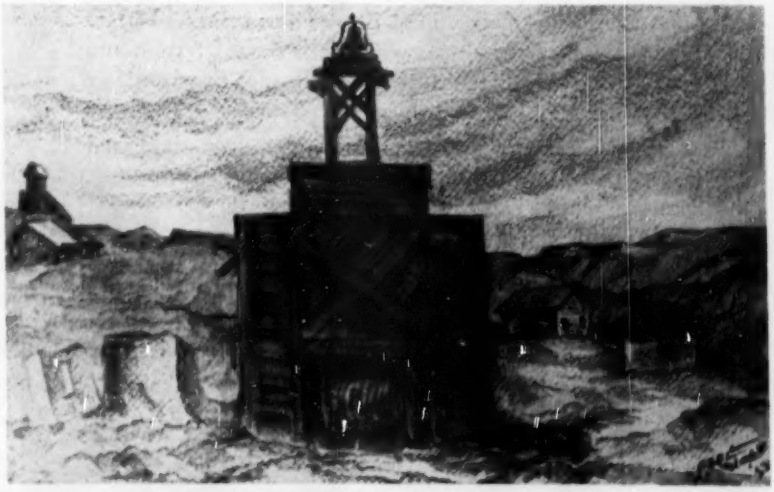
In 1861, O. G. Leach, E. Donohue, and L. H. Dearborn were prospecting on Bodie Bluff when Dearborn discovered the Bunker Hill (later included in the Standard property). Placer diggings near the Bunker Hill shaft paid "two to three ounces a day hand washing."

Bodie ore was expensive to extract. The veins were hard at the surface and the decomposed, softer rock was found only at considerable depth. Since most of the companies operating in the district were short of capital, it was thought best by the several owners to consolidate them. A stock certificate dated March 9, 1863 bears the signature of Leland Stanford, President of the Bodie Bluff Consolidated Mining Co.—a business enterprise incorporated that year with 11,000 shares and capital stock of $1,110,000. By July 1864, many small workings were consolidated as the Empire Company of New York, whose capital stock was $10,000,000. This company spent thousands on development of the several properties and bought the Fogus mill in Aurora, Nevada, moved it to Bodie, and rebuilt it at the north end of Bodie Bluff, where it ran 10 years.

During most of the 1860's the camp grew slowly, eclipsed by Aurora, the spectacular silver camp just 10 miles away. One of the earliest descriptions of Bodie is given by J. Ross Browne, writer, traveler and correspondent for *Harpers Monthly Magazine*. Browne writes of the camp in the August 1865 issue as follows: "Some eight or nine miles from Aurora we reached the base of a conical hill, surmounted by a range of reddish-colored cliffs, very rough, jagged and picturesque; a capital-looking place for a den of robbers or a gold mine. . . . Several companies are engaged in working the principal veins that extend through Bodie Bluff—the largest interests are held by the Empire Gold & Silver Mining Company of New York. . . . Ores taken from the district are subject to an expense of $8.00 per ton for hauling and $20.00 a ton for working at the Aurora mills."

In 1872 the Old Bullion claim was staked; by 1874 the mine was closed down. The following year two miners, while investigating the location, found that a cave-in had uncovered a new lead. The men began to work their discovery vein, packing the ore to Rough Creek, where it was milled in an arrastra. In 1876 they sold out to the Standard Consolidated Company, which then began a systematic development of the property.

By 1878 the Bodie Mining Company struck gold and silver ore and constructed a small mill which handled the ore so successfully that in a short time $600,000 had been recovered and mine shares, which originally cost $0.50, brought $54.00.



Firehouse in Bodie, 1952, with the hand-drawn hose cart.

With this and other strikes, Bodie stock began to appear on the San Francisco Mining Exchange. In no time, between 1,200 and 1,500 men jostled each other as they raced to Bodie Bluff. With the boom days of the Comstock past, Bodie was regarded as the coming camp and men left Virginia City and hurried south to be in on the new bonanza.

Steady mining began in 1879 and thereafter the Standard Consolidated was the biggest property in camp. R. Gilman Brown in the *Bi-Monthly Bulletin of the American Institute of Mining Engineers* of July 1907, describes "The Vein System of the Standard Mine." The original Standard mine consisted of two claims, but for over 10 productive years it included "properties formerly known as Bodie, Momo and Leut shafts on the south; Bulwer and Belvidere on the west; Bodie Tunnel and Tioga on the north and Summit-Harrington Tunnel on the east," its holdings covering 200 acres.

The highest grade ore occurred in three great veins, the Fortuna, Incline and Burgess. The Fortuna lay in the southern portion of the Standard property and the Burgess cut the 300-foot level of the Bodie mine, "south of the Standard line." John Broderick, foreman of the Bodie at the time of this discovery, liked to tell how the ore in the vein was not thought valuable at first and the men were ready to discard it as waste until "he saw in it a sprinkling of coarse gold." By 1881 the Standard Consolidated was said to be the most profitable quartz lode in California. In 25 years it produced between $14,500,000 and $20,000,000 and paid out $5,000,000 in dividends. By 1886 Mono County ranked next to Nevada County, California in gold production.

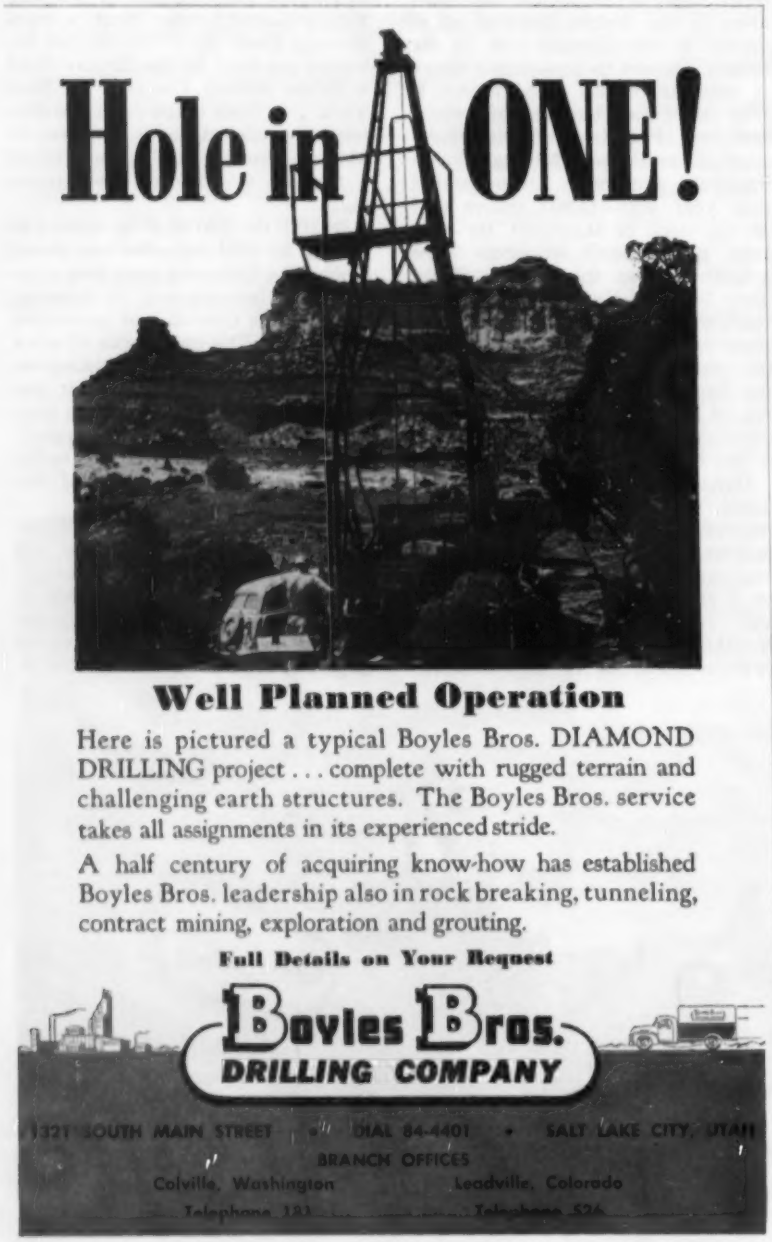
Between 1877 and 1888 Bodie mines produced $18,097,922. The entire region is said to have produced $25,000,000. But the rich ore lay above the 800-foot level of the mines and when that depth was reached, the veins pinched out. By 1888 the mining boom was over and the camp began to fade.

Although half the business section was lost by fire in 1932, a remarkably large portion of the town survived. Fire hydrants along the principal streets and a hand-drawn hosecart, protected by a frame firehouse no larger than a single garage, explains, perhaps why some of Bodie withstood the blaze. Among the buildings lost was the Bodie Bank, opened by J. C. Cain, and for years the only bank in Mono County. Today only its vault remains.

By 1951 the Cain family of Bridgeport, California, old residents of Bodie, had bought most of the town. The Miners' Union Hall is still standing and is at present a museum; its contents collected tirelessly by Mrs. Ella Cain. In summer a caretaker shows the many relics to tourists who journey to the weatherbeaten camp. Beside the building stand an old freight wagon and a sleigh, partly hidden by tall, waving bunch grass.

The cemeteries are at the northwest end of town and a little above it—one fenced and filled with graves, surrounded by pickets and wrought-iron protections. The more colorful characters who died of "sagebrush whiskey and poor doctors" were buried outside the fenced portion. One story (concerning the cemetery) is told of a merchant who married a dance-hall girl, Bodie Rose. He died and was buried within the fence. She died a few days later and was laid beside him, but just outside the fence.

Ten thousand people crowded into Bodie during its best years. By 1912 that number had shrunk to 1,000; by 1908 to 800; by 1946 to 8 and by 1951 to one—the caretaker.



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ACTIVITIES OF U. S. MINING MEN

ROBERT G. HEERS, manager of the Sunnyside Coal Mines in Utah, has been named manager of mining and raw materials for Kaiser Steel Corporation. His new position will place him in charge of mining operations and the flow of material from the company's Utah coal mines and iron ore properties in Riverside, California to the steel plant in Fontana, California. Mr. Heers joined Kaiser in 1943 as a mining engineer. His new headquarters will be at the Fontana plant.

Several promotions were announced recently at the Cleveland-Cliffs Iron Company in Ishpeming, Michigan, including the appointment of **Burton H. Boyum** as chief geologist. He succeeds **E. L. Derby, Jr.,** who will continue with the company in a consulting capacity. **S. W. Sundeen,** assistant manager of the mining department, has been promoted to manager of the ore development division. He will have charge of the company's low-grade ore program in Michigan and Minnesota. New Michigan District Geologist is **Gerald Anderson,** formerly senior geologist.

R. H. B. Jones, consulting geologist for the Oliver Iron Mining Division of the United States Steel Corporation, has been named staff geologist for U. S. Steel's Columbia-Geneva Steel Division. He joined Oliver in 1930 as a geologist, after holding assistant professorships for several years at Washington States College and Indiana State Teachers College. Mr. Jones' headquarters will be in San Francisco, California.

Robert Chapman, formerly with the Union Carbide and Carbon Corporation, New York City, has been appointed assistant resident manager of the Potash Company of America's Carlsbad, New Mexico plant.

C. H. (Pat) Murphy sales representative for U.S. Steel Corporation's American Steel and Wire Division in New Mexico, has resigned that position to become executive director of the New Mexico Mining Association. His headquarters are now in Santa Fe, since the association's office was moved there April 1. Mr. Murphy will be in charge of the Association's activities, and part of his job will be to visit various sections of the state, keeping in close contact with all phases of the minerals industry.

Ward Ballmer, public relations engineer for Chino Mines Division of the Kennecott Copper Corporation in Silver City, New Mexico, is now on the Kennecott public relations staff in New York City.

Mark E. Riley, mine superintendent for the Bonne Terre lead mines in Missouri, has replaced **Norman H. Donald, Jr.** as assistant division manager of the St. Joseph Lead Company's Edwards Division. Mr. Riley has been with St. Joseph Lead since 1937. His new office is at Balmat, New York.

Walter R. Eastman, mining engineer, is manager of the newly established factory sales and service branch of the E. J. Longyear & Company in Salt Lake City, Utah. Mr. Eastman's background includes work in the Belgian Congo for a Portuguese diamond mining concern, mining on the Mesabi Range, and a position as a mining engineer for an affiliate of Anaconda Copper Mining Company. The new Longyear branch will serve the western area of the United States, including Colorado, Montana, Utah, Idaho, New Mexico, Arizona, and Nevada.

Walter J. Williams has left the Atomic Energy Commission to become vice president of the Taconite Contracting Corporation, a Lake Superior subsidiary of the Erie Mining Company. Mr. Williams, called a "key man" in atomic energy development of the last decade by AEC chairman Lewis L. Strauss, has been general deputy manager of the nuclear energy program since 1951. Previous to that time he was manager of field operations for the AEC. His new post will include development of taconite in the Lake Superior iron ore region.

Southwest Research Institute, in San Antonio, Texas, has made several additions to its technical staff. Included in the new personnel are **Orin M. Anderson,** research engineer in the Engineering Mechanics Department; **S. J. Backey,** section manager for the Engines, Fuels and Lubricants research department; **Raymond Cappel, George Coyle, Victor C. Kobold, Walter K. Morris,** and **James G. Pauly,** project engineers; **Raymond A. Garren,** electronics technician; **Howard A. Langan,** research engineer, and **S. H. Simpson, Jr.,** supervisor for the Physics Department's communications section.

Staff changes in the Consolidated Feldspar department of the International Minerals and Chemical Corporation were announced in Chicago, Illinois. **Robert W. Lawson,** formerly general manager of the division, has been appointed administrative assistant to **Norman J. Dunbeck,** divisional vice president. Mr. Lawson is being succeeded by **E. W. Koenig,** technical director of the department. **Ed Boone,** production manager and veteran in the Feldspar industry, has retired, but will continue with the company as a consultant. His successor is **Charles E. Hunter.** Others promoted are **W. Branch Lawson,** assistant manager, and **Thomas T. Lawson,** assistant production manager.

A. S. KROMER, manager of the Wolverine Tube Division plant in Decatur, Alabama, has been named manager of the Calumet Division of Calumet and Hecla, Inc. He succeeds O. A. ROCKWELL, who has assumed the position of general manager of the mining and smelting division of the Eagle-Picher Company in Ohio, replacing ELMER ISERN. Mr. Kromer's headquarters will be in Calumet, Michigan. The division he heads operates copper mines in the Upper Peninsula of Michigan and also produces zinc and lead ore concentrates in Wisconsin.

JOHN HILL, former superintendent of mining operations for U. S. Vanadium Company, is manager of a newly formed uranium producing company, Worcester Mines. The new firm has uranium properties in the Uravan, Colorado area. Mr. Hill had been with U. S. Vanadium, a division of Union Carbide and Carbon Corporation, for 17 years. His new headquarters will be in Grand Junction, Colorado.

N. H. Donald, Jr., assistant manager of the Edwards division of the St. Joseph Lead Company in Balmat, New York, is now assigned to the main office of the firm in New York City. In his new capacity he is concerned mainly with exploration work for the company.

Sam H. Morris, chairman of the Arizona Copper Tariff Commission, and **R. W. Hughes,** general manager of the Miami Copper Company, have been elected to the board of directors of the firm and its subsidiaries.

R. T. Bell, superintendent of Pickands Mather & Co.'s Bennett mine in Keewatin, Minnesota, was promoted to assistant to the general superintendent of the Hibbing district recently. Succeeding Mr. Bell at Keewatin is **E. R. Tyler,** assistant superintendent at the Plymouth mine in Wakefield, Michigan. Others promoted at Pickands Mather include **L. M. Becker,** superintendent at the West Hill mine, who now supervises both the West Hill and Tioga mines; **Arne Lehtinen,** Wade mine engineer, who was advanced to the post of assistant superintendent at West Hill, and **R. Kirwin,** Tioga foreman, who was promoted to assistant superintendent.

A. T. Cape took over the chairmanship of the Southern California section, A.I.M.E., last month in Los Angeles. Mr. Cape is with the Superweld Corporation of North Hollywood. Other officers installed by the section were **J. Shannon Baker,** secretary; **C. W. Six,** treasurer; **Milton E. Loy,** petroleum branch chairman; **Howard E. Pellett,** metals branch chairman, and **John H. Eggers,** mining branch chairman.

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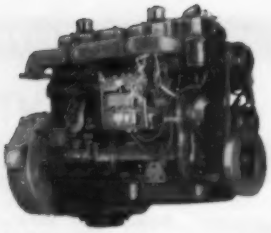

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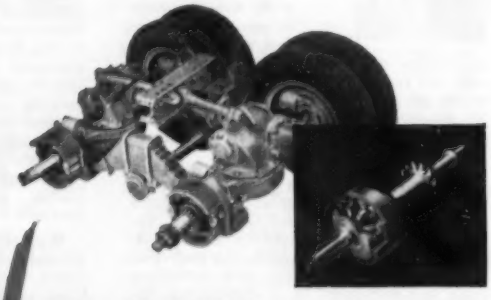

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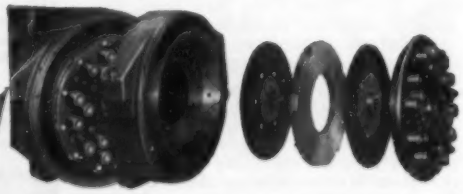

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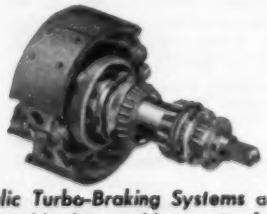

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ACTIVITIES OF INTERNATIONAL MINING MEN

D. P. Loemban Tobing, mining engineer from The Netherlands, has assumed a position with the N. V. Algemeene Industrieele Mijnbouw in Indonesia. The firm is engaged in producing manganese.

H. R. Cooke, head of a geological exploration project for the Northern Peru Mining and Smelting Company in Peru, has completed his contract and is now on vacation in Europe. He expects to return to the United States in June.

George Woods heads a World Bank mission which has been in India investigating the Indian government's request for a loan to develop new steel plants in the country. The mission has been inspecting plants in the Delhi, Bombay, and Calcutta areas.

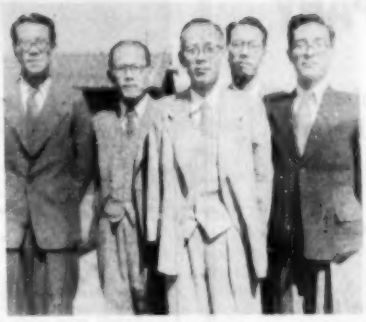
O. Soskice, formerly with New Consolidated Gold Fields, Ltd., in Dar Es Salaan, Tanganyika, Africa, is the new United Kingdom representative with the Combined Development Agency in Johannesburg, Union of South Africa.

Horace F. Fraser, vice president and general manager of Falconbridge Nickel Mines, Ltd., has been elected president of the Canadian Metal Mining Association. He succeeds **J. A. H. Patterson.** Other officers for the association are **R. R. Brown,** first vice-president; **J. B. Redpath,** second vice-president, and **P. N. Tapley,** treasurer. **V. C. Wansbrough** was reelected vice-president.

Harold E. Robbins holds the newly created post of general superintendent for the Andes Copper Corporation in Chile. He has been with the corporation since 1928.

A German steel mission, headed by **Dr. Hansan,** representing the Krupps firm, has been in India completing plans for the construction of a steel plant near Calcutta. The plant is the outcome of a recently concluded agreement with the Government of India. Conferring with Dr. Hansan and other German steel experts was the Indian secretary to the Central Government's Ministry of Production.

THOMAS BRENNAN NOLAN, assistant director of the United States Geological Survey, was presented the K. C. Li Medal for "meritorious achievement in advancing the science of tungsten" during a ceremony in New York City in February. Dr. Nolan, who is the second man to receive the medal and $1,000 prize, is considered the Survey's tungsten specialist. During World War II he was in charge of a study of domestic occurrences of tungsten. Under his direction the Survey examined all known deposits and improved analytical methods for low-grade ores. Dr. Nolan has been with the Survey since 1924 and was made assistant director in 1945.



Pictured above are officials of the Sumitomo Metal Mining Company at Niihama, Shikoku, Japan. They are (left to right) T. NAKA, chief of the Planning Department; M. IZUMI, General Affairs Section, Besshi Mine Office; S. AKUTAGAWA, chief of the Economic Department, and two members of the Refinery staff at Niihama.

Three senior promotions have been announced by Dome Mines, Ltd. of Toronto, Canada. **Robert S. Stronach,** mining engineer for the firm, has been named vice-president of one of the firm's subsidiaries, Dome Exploration, Ltd. in Canada. **Joseph Chisholm,** who has been with the parent company since 1934, is the new general manager of Campbell Red Lake Mines, and **Frank J. O'Connell** has been named general manager of another Dome subsidiary, Sigma Mines, Ltd. in Quebec.

Everett Graff, mining geologist for the Cerro de Pasco Mining Company, has returned to Peru after a brief visit in the United States. While in Spokane, Washington, Mr. Graff, who has his own consulting business in Lima, expressed an optimistic view of mining opportunities in Peru.

Fred B. Kerridge, consulting engineer for the United Nations Technical Assistance Administration, has been assigned to survey electrical installations in Bolivian mines. The UNTAA hopes to overcome some of the special problems in the mines which have been caused by the high altitude. In addition to studying necessary changes in electrical equipment, Mr. Kerridge will advise on proper mining equipment maintenance.

E. C. Roper, general manager of Britannia Mining and Smelting Company, Ltd., has been re-elected president of the Mining Association of British Columbia.

K. P. Chikara, consulting geological engineer in Salisbury, Southern Rhodesia, has completed a mineral survey in Arabia. He followed his Arabian visit with a trip to Egypt and has just completed a tour of portions of Europe.

J. S. Smart, Jr., assistant to the vice president and director of research at American Smelting and Refining Company's plant in Perth Amboy, New Jersey, will be in Australia during May. He is scheduled to lecture at the Australian Institute of Metals in Wollongang, New South Wales.

A. G. Pentland, geologist for Sheep Creek Gold, Ltd., has been elected president of West Kootenay Mine Safety Association at Nelson, British Columbia. He succeeds **Thomas R. Buckham,** manager of the Carnegie Mines in Montreal, Quebec.

John Ivan was elected president of Belpat Molybdenum Mines, Ltd. at a recent meeting of the company's board of directors in Montreal, Canada.

P. K. Aamo, mining engineer, has accepted the position of manager of A/S Ardal of Sunndal Verk Division in Glaerem, Durnadal, Norway. Previously, Mr. Aamo was with A/S Knaben Molybdeangruber in Knaben Gruvor.

G. C. Monture, chief of the mineral resources division of the Canadian Department of Mines and Technical Surveys, is acting as mining advisor for a World Bank survey group in Malaya. The group, headed by **Sir Louis Chick,** was assembled by the International Bank for Reconstruction and Development to make a general study of the Malayan economy. Since the country has suffered from rubber and tin overspecialization, the UN group is investigating the possibility of utilizing other mineral resources in the country, such as bauxite, gold, tungsten, lead, and iron.

Paul Klempner is now Area Drifting Engineer for the No. 1 Area, which includes 12 coal mines, of the Durham Division of the United Kingdom's National Coal Board. His headquarters are in South Shields, England.

M. Mitomi, deputy manager of the Matsuo Mining Company, Ltd. of Japan is on his way to the United States where he plans to study recent developments in mining and chemical technology. Mr. Mitomi supervises operations at the Matsuo Mine, which is the largest sulphur and pyrite mine in Japan, according to **Hajime Kagayama,** managing director of the Matsuo Mining Company.

W. A. van der Hoff, consulting mining engineer, is currently in Surinam investigating iron ore deposits.

MAURICE F. DUFOUR, who is in charge of the Freeport Sulphur Company's nickel and cobalt project at Moa Bay, Cuba, has been named assistant vice president for the firm. Mr. Dufour joined Freeport in 1933 and has been manager of development since 1951. From 1943 to 1947 he was assistant manager and then general manager of the nickel mining plant which was built and operated by Freeport for the United States government at Nicaro, Cuba.

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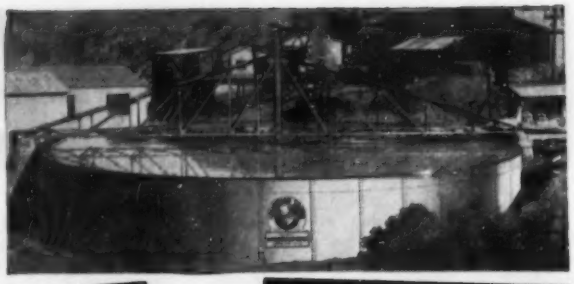

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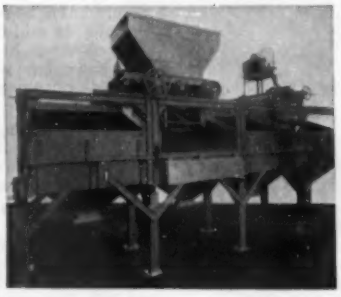

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National Lead Increasing Australian Explorations

National Lead Company's subsidiary Titanium Alloy Manuafacturing Co., Ltd. has secured Australian governmental concessions for mineral exploration in the Northern Territory. Indications of copper, lead, zinc, and nickel have already been found on the concession.

The company has also secured an option on a 4,200-square-mile area starting 20 miles west of Alice Springs and extending 200 miles westerly into the desert country. C. J. Sullivan, former assistant chief Commonwealth geologist, was the original holder of the exploration permit which he optioned. Low-grade copper mineralization has been reported as cropping out at many points over a 100-mile length southwest of Alice Springs. Test drilling has found copper mineralization in sedimentary rocks but a great deal of exploration is necessary to determine if ore exists in the area.

The company has mined and concentrated rutile, zircon, and monazite-bearing beach sands along the eastern Australian coast for a number of years and exported the minerals to the United States.

MacLaren River Announced As Site Of Alaskan Copper

The location and grade of an Alaskan copper deposit, along with the name of its discoverer, has now been revealed although the find was made last summer.

After working for two years on a rumor from an old-time prospector that there was copper in the region around the MacLaren River, John Pettyjohn of Big Delta located the copper vein 15 miles above the MacLaren River glacier crossing of the Cantwell Trail, and 12 miles from the proposed extension of the McKinley Park road. The vein, one of the 16, was discovered on the side of a deep gulch at 4,000 feet above sea level. Mr. Pettyjohn and his partner, E. O. Albertson, have staked 11 claims, plus a tunnel site.

A crew from the United States Geological Survey has reportedly checked the area and will soon release a detailed report. Meanwhile, a U.S.G.S. analysis of a sample taken from the 10½-foot-wide vein was said to contain as much as 45 percent copper.

Bikita Minerals Acquires Large Pegmatite Group

After a period of intensive prospecting and exploratory work, Bikita Minerals Ltd., a subsidiary of the Selection Trust, has exercised its option and acquired the claims of Messrs. Douglas Lawrie Ltd., and of A. O. McMurdon. The group includes the Nigel Tin, Bikita Tin, Conwar, Cumulus, Stratus, Cyrrus, Clive, Kath, and other blocks in the Bikita Tinfields, 45 miles from Fort Victoria, Southern Rhodesia.

The ore body is a flatly dipping giant pegmatite, displaying unusual regularity of mineralization. The country rock is basement schist of the Fort Victoria schist belt, surrounded by granite masses. Both claims groups are situated on the same pegmatite dike.

The mineralization consists of a sequence of giant lenses and irregular masses of petalite ($Li_2O{\cdot}Al_2O_3{\cdot}6SiO_2$) and lepidolite ($LiKAl_2F_2Si_2O_5$), accompanied by spodumene and ambylgonite as well as beryl. Greisen zones and certain sections of albite carry disseminated tantalite which is also found in appreciable quantities concentrated in residual and eluvial surface rubble layers. Adjoining are the Al Hyat claims, the largest single petalite ore quarry and producer in the country. This giant pegmatite has produced the largest part of Southern Rhodesia's total beryl, tantalite and lithium ore output.

Sharing in the financing of the project with Selection Trust are the American Potash and Chemical Corporation and the American Metal Company Ltd.

Canadian Firm Begins Work On New Chicoutimi Smelter

Eastern Smelting and Refining Company, Ltd. is beginning construction of a nickel-copper custom smelter and refinery at Chicoutimi, Quebec. Daily capacity of the smelter is expected to reach 200 tons of nickel-copper concentrates and 200 tons of copper concentrates.

The company has received an Order-in-Council from the Quebec government to build the plant, establish power facilities on the Chicoutimi River, and purchase Quebec Pulp and Paper Corporation assets at Chicoutimi. The firm expects to provide 25,000 horsepower annually for the plant by harnessing the Chicoutimi River rapids.

Annual metal production at the plant will be 27,000,000 pounds refined copper and 7,000,000 pounds refined nickel. Associated mines, including the Eastern Metals Corporation of Quebec, and custom shippers will provide concentrates for the refinery.

President and managing director of Eastern Smelting and Refining is Andrew Robertson, who recently was named to the post. He is the former vice president

Andrew Robertson

and general manager of Barvue Mines, Ltd. and Golden Manitou Mines, Ltd., both of Toronto. Recently, Mr. Robertson was also appointed vice president and managing director of Ascot Metals Corporation, Ltd., Eastern Metals Corporation, Ltd., Quebec Nickel Corporation, Ltd., and Albert Metals Corporation, Ltd., all of Quebec.

Uranium Purchase Pact Arouses Debate in Belgium

A governmental agreement drawn up in 1944, giving the United States and Great Britain exclusive purchase rights to the Belgian pitchblende produced in Katanga, Belgian Congo, has been the subject of recent debate in Belgium.

The deposit, owned and operated by the Union Miniere du Haut Katanga at Shinkolobwe in the Katanga Province, has been shipped exclusively to the United States and Great Britain since signing of a treaty in 1944 by the two governments and Belgium. Recent debates in the Belgian Chamber of Representatives have questioned the terms of the agreement, and complaints that the price of the Katanga ore is too low have been voiced by the Belgian press.

According to Mr. van Zeeland, the Belgian Foreign Minister, negotiations to improve Belgium's position in the contract have been going on since 1948. Expiration date of the contract has not been made public, but when the agreement is completed the Belgium government has indicated that it will require a full partnership, the benefit of the most favored nation clause, and a relatively short term of existence for the new agreement.

Tungsten Trading To Be Freed In London April 1st

Tungsten ore and concentrate buying and selling in England has been returned to private trading as of April 1st. The Ministry of Materials plans for a smooth transition from government to private trading and hopes to prevent a further drop in the London market. On March 1st tungsten ores and concentrates, 65 percent WO_3, were quoted at $16.80 per long ton unit.

So. Rhodesia Increasing Its Lithium Production

Lithium production in Southern Rhodesia has soared since the United States has increased its demand for the ore. Output during the first eight months of 1953 was 7,107 long tons, while total production in 1952 amounted to only 1,479 long tons.

The ore produced is mainly petalite ($Li_2O{\cdot}Al_2O_3{\cdot}6SiO_2$) and lepidolite containing from 3.50 percent to 4.0 percent Li_2O. A small amount of spodumene ($Li_2O{\cdot}Al_2O_3{\cdot}4SiO_2$) was also produced, but the production of high-grade amblygonite ($LiF{\cdot}AlPO_4$), containing normally 7 to 8 percent Li_2O, was small.

The largest part of the lithium ore production in 1953 was derived from one highly mineralized pegmatite dike in the Bikita area, Fort Victoria district, namely from the Al Hayat and Boom workings, as well as from the Douglas Lawrie Ltd. operation on the Bikita tin claims. The latter are now being explored and examined on option by the Bikita Minerals Ltd., a subsidiary of the Selection Trust Group. Massive beryl and tantalite ore are recovered as byproducts.

Numerous deposits of lepidolite are known to occur in the Miami mica fields, as well as in the Fungwe, Mtoko, and Macota reserves. Previous limited market requirements and, consequently, low prices for low-grade ore, as well as con-

siderable distance of these deposits from rail, have until recently prohibited development. A further increase in production is expected shortly.

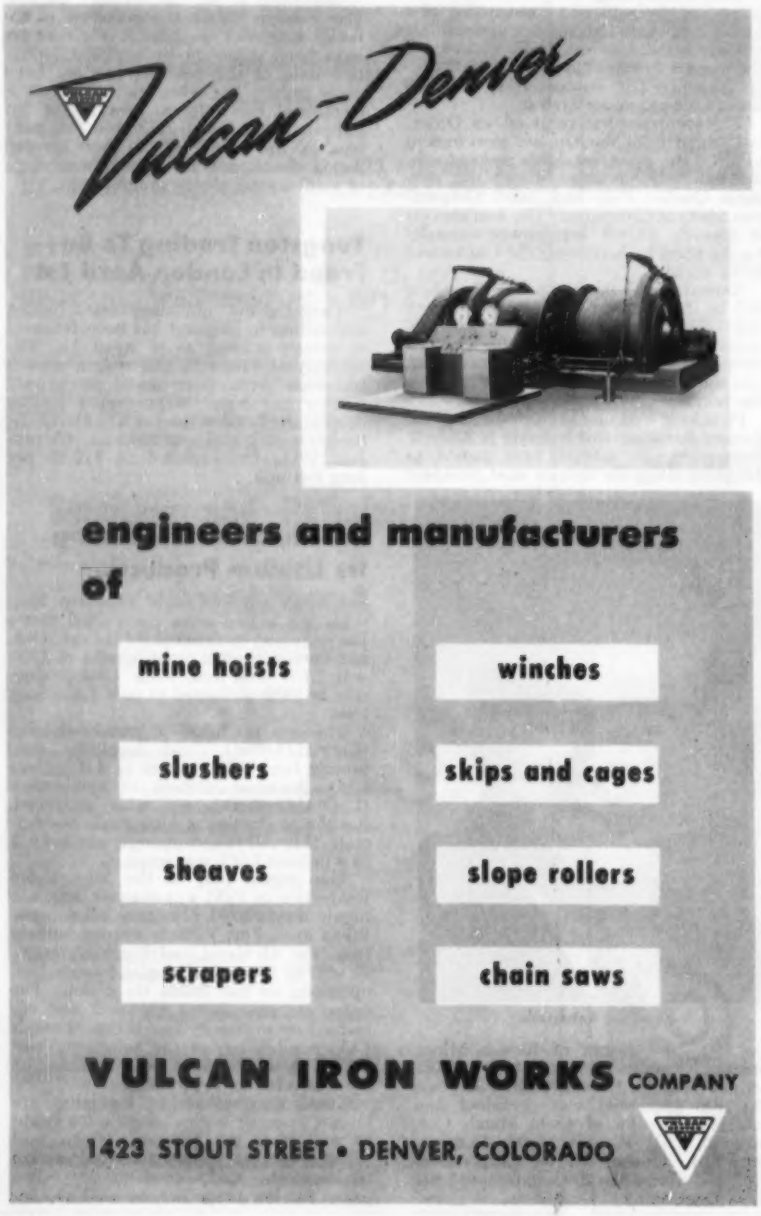
Union Carbide Exploring Mozambique & Nyasaland

Union Carbide and Carbon Corporation of New York is the latest United States firm to enter the minerals field in Africa.

Acting through its subsidiary, Minerals Research Syndicate, Ltd., the firm is embarking on a large-scale exploratory program on the monazite deposit of the Kangkangunde Hill in the Southern Province of Nyasaland. The company owns a special grant under the radioactive ordinance over a large area in the Southern Province. Monazite occurs as disseminated ore in calcite matrix in a carbonatite ring-structure at Kangkangunde Hill. The peculiarity of the mineral is absence of thoria, which renders it non-radioactive. It consists of almost pure cerium phosphate.

In Mozambique, Union Carbide is interested in a concession area along the entire sea coast. The company has applied to the Ministry of Overseas Provinces in Lisbon, Portugal for an exclusive mineral concession for all of the minerals in this region. It covers a shore strip 22 kilometers wide, as well as an additional stretch of ground following every river 40 kilometers inland in a width of 10 kilometers. The main object is exploitation of minerals in beach sands and river alluvial.

Ilmenite and rutile sands are known to exist in the beach sands near the mouth of the Incomatic River in the Province Sul do Save and columbite, monazite, rutile, euxenite, samarskite, and zircon are known to occur in the stretch between Mozambique and Quelimane. The latter minerals are derived from the Alto Ligonha pegmatite belt, which has recently been surveyed by the Aero Service Corporation. Union Carbide has already undertaken a preliminary reconnaissance survey with an airborne scintillatino counter.



INDIA—A 42-mile-long gold belt has been discovered along the Baitarni River in Orissa. Prospectors, mining experts, and research technicians who have been posted at the site by the Indian Bureau of Scientific Research are busy investigating the area. Research work is expected to last two years. Gold prospecting has already started in 13 sections of a trench where the gold was first discovered. According to the Finance Minister, Radhanath Rath, "If extraction could be improved and mechanized on the lines followed by the Kolar Gold Field in Mysore, the quantum of gold content per 100 square feet might easily be doubled." The Union government is reported to have decided to establish a small laboratory near the mining site to facilitate research work. Experts are reported to have observed indications of titanium deposits in the area and a more detailed survey will be undertaken to assess titanium prospects.

THAILAND—Conditions for mining companies are becoming increasingly difficult in Thailand, says the chairman of *Burma-Malay Tin Ltd.*, S.F. Utz—so difficult that the firm is considering the wisdom of extending the company's activities there. According to Mr. Utz, "permits are required for almost everything, and although this appears to be a world-wide trend, the time factor in obtaining them is far worse in Thailand. One hundred percent of tin ore sales proceeds must now be held in the country and the permitted withdrawals are far too restricted." Mr. Utz also says that the latest Import Regulations apply to dredge equipment and are so stringent that "they could cause the stoppage of dredges."

TURKEY—The *Eti Bank* is operating a new and ultra-modern coal preparation plant at Soma. The new plant was designed, equipped, and erected by *McNally Pittsburg Manufacturing Corporation* of Pittsburg, Kansas. The fully automatic washing equipment consists of coarse coal and fine coal washers of the McNally Norton Baum jig type. The plant is designed to produce 165 short tons of coal per hour. A lignite mine at Soma will furnish the coal.

INDIA—Technical experts of the German steel combine, *Krupps-Demag*, have recommended Rourkela in Orissa as the most suitable site for the $150,000,000 steel plant to be erected in India. They selected this location not only from the viewpoint of economics of production, but also transportation facilities and other considerations. The Government of India has not yet decided on the site. Three other areas under consideration are Bil-

hai in Madhya Pradesh; Sindri in Bihar; and Durgapur in West Bengal.

PERSIA—The Persian government is reported to have granted a concession to a British financial and mining group for the development of 34,000 square miles for iron, sulphur, lead, manganese, copper, chrome and other minerals. New laws are being drafted for the protection of profits and part of the capital. The government is anxious for foreign investment and is drafting the new legislation as an attraction. The main concessions are at Nemnan 130 miles east of Teheran, and at Shamsaba 200 miles to the west.

MALAYA—According to Malayan reports, the iron ore mining project to be undertaken by the *Eastern Mining and Metals Company* is partly supported by United States capital. The project is in central Pahang to the north of the Rompin River about 70 miles inland in the Ulu Rompin. In addition to the information reported in MINING WORLD, January 1954, page 63, it has now been learned that two alternatives are being considered for loading the ore. The first would be to construct a long jetty into deep water, and the ore would be loaded into a ship's hold by conveyor belt. The second plan is for construction of a railroad across the Rompin, Pontian, and Endau Rivers to Tanjong Penyabong or Blair Harbor where an all-year port could be constructed. The latter plan has particular merits because Eastern Metals is also interested in development of the former Japanese iron ore mines lying inland from Endau in North Johore and South Pahang, the products of which could be loaded from the same port.

PAKISTAN—Iron ore is reported to have been discovered in the Gadun area of the Mardan district. Samples are being tested by the Pakistan Geological Laboratories. Development of the deposit may be undertaken if sufficient quantities of iron are found.

GOA (PORTUGESE INDIA)—Goa's mining industry is reported to be facing a "serious slump," with foreign buyers (chiefly Japan and West Germany) refusing Goan export offers for iron and manganese ore. Export prices for iron ore are said to have dropped from $9.25 to $6.10, and even then buyers are "not forthcoming." Barges, tugs, and other means of port transportation are said to be lying idle.

INDIA—*Indian Copper Corporation Ltd.* treated 88,860 short tons of ore during the quarter ended December 31, 1953. During the same period 1,925 long tons of refined copper were produced. At the *Mosaboni* mine 457 feet were developed during this time and at the *Badia* 626 feet were developed.

AFRICA

UNION OF SOUTH AFRICA—*Klerksdorp Consolidated Goldfields Company* has started a diamond drilling program on the farm Rhenosterhoek 52, immediately north of the *Dominion Reefs Company's* property to the west of Klerksdorp. The program has been undertaken in order to test the uranium possibilities of the Rhenosterhoek forma-

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tions, which form the extension of those in the Dominion Reefs property. The latter has already been declared a uranium producer and production is expected to be started about the middle of 1955.

UNION OF SOUTH AFRICA—One of the smaller gold-uranium mines in the Klerksdorp mining area of the Orange Free State, the *Ellaton Gold Mining Company*, started gold production in January; during that month 21,000 tons of ore were milled. Equipping of the main shaft and cutting of the ore and waste pass systems were completed during the final quarter of 1953, when full scale development operations at the shaft were started. The sampled footage was more than doubled in the final quarter to 3,040 feet from 1,440 feet, payability increased to 97 percent from 91.3 percent, and values to 545 inch-dwt. from 484 inch-dwt. (See MINING WORLD, June 1953, page 73, for location map of this district.)

NIGERIA—*Jantar Nigeria Company* has contracted to sell its columbite output available for shipment before the end of June 1954 through the United States Emergency Procurement Service. The price is $1.40 per pound of combined columbium-tantalum pentoxides contained in concentrates plus a premium of two cents per pound for each additional full percent of combined pentoxides contained above 35 percent. Other contract negotiations are still under way.

SIERRA LEONE—An exclusive license to prospect for bauxite has been granted to the *British Aluminium Company*. The area covered by the license totals about 147 square miles, located on a peninsula about 60 miles south of Iles de Los where *Bauxites du Midi* mines about 300,000 tons of bauxite annually for shipment to Canada.

NORTHERN RHODESIA—For the six-month period ended December 31, 1953, *Roan Antelope Copper Mines Ltd.* produced 44,222 long tons of blister copper. During this same period, *Mufulira Copper Mines Ltd.* produced 43,426 long tons of primary copper. Both firms report that financial results during August, September, and October of this period were affected by lower deliveries caused, in turn, by the reopening of the London Metal Exchange for dealings in copper on August 5, 1953 after nearly 14 years of government control. During the control period, the companies had been selling virtually all of their production either to the British Ministry of Supply or to the British Ministry of Materials on an f.o.b. Beira basis. With the resumption of free dealings in copper, these firms had to change to c.i.f. Europe U.S.A., which necessitated establishment of "pipelines" to consumers in the United Kingdom and in the United States. As a result, actual deliveries to consumers during August, September, and October were considerably lower than production for those months. Sales are expected to be normal from now on, however.

UNION OF SOUTH AFRICA—At the *Virginia* mine of *Virginia Orange Free State Gold Mining Company Ltd.*, trial milling operations using development rock were started in November 1953 in the first 50,000 tons-per-month section of the reduction plant and regular gold production is now expected shortly. Extensions to the plant to increase capacity to 75,000 tons per month are in progress. The uranium and sulphuric acid plants, the latter being one of the world's largest, are under construction and production is expected within the next year. During the final quarter of last year, the Nos. 1 and 2 shafts were connected on two levels, thereby removing the single entry restrictions on the number of personnel imposed by the mining regulations. There was a marked advance in the footage sampled during the final quarter, from 2,125 feet to 3,685 feet. However, payability declined to 63.6 percent from 67.3 percent and values from 299 inch-dwt. to 275 inch-dwt.

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PERU—*Utah Construction Company* is conducting exploratory diamond drilling for *Republic Steel Corporation* on the 30,000 hectares of potential iron ore lands recently optioned by Republic from *Pen American Commodities, S.A.* of Lima. (See MINING WORLD, February 1954, page 25.) The deposit is located in the foothills of the Andes above

Standard Engineer's Report

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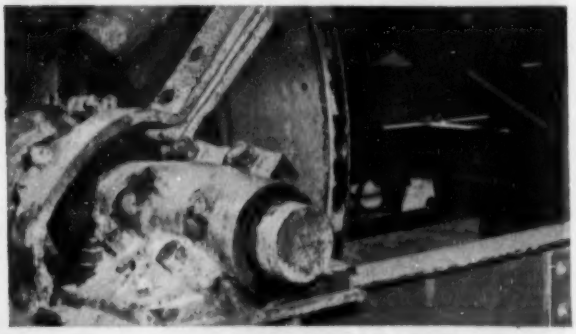

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the Acari River valley, about 60 kilometers east of the 600-square-kilometer iron ore concession presently being developed by *Marcona Mining Company* (a joint operation of Utah Construction and *Cyprus Mines Corporation*). About seven kilometers of new road were constructed from existing roads in the Nazca Valley into the property, located at an elevation of 2,000 to 3,000 feet. The first 90-meter drill hole completed reportedly showed iron values running in excess of 65 percent.

CHILE—A storm caused a landslide which halted work at the *Braden Copper Company's El Teniente* copper mine during February.

SURINAM—The Geological and Mining Service is prospecting an occurrence of tungsten near the Paramaribo-Kabel Railroad, about 50 miles south of Paramaribo. Prospecting cuts in the hillside are being made with a bulldozer.

JAMAICA—A survey team has explored the Cockpit area of the island for *Reynolds Jamaica Mines Ltd.*, a subsidiary of *Reynolds Metals Company*. Some quantities of bauxite were found, and the firm is expected to open negotiations with the Jamaican government for mineral rights in the area.

MEXICO—Federal government money and technical aid are reviving operations in the Real de Catorce mining zone, San Luis Potosí, reports the congressional mining committee. The first project is driving of a two-mile drainage tunnel to dewater the mines. This will be done at a cost of $350,000.

PERU—Exploration activities reported in Peru during the past year included the following. *Cerro de Pasco Corporation* completed exploratory drilling of the *Tiabaya* copper prospect with reportedly favorable results. *La India (Noranda Mines Ltd.)* dropped its option on the *Chapi* copper prospect near Arequipa after diamond drilling. *M. A. Hochschild* is continuing underground exploration and drilling of the nearby *Condoroma* and *Cata* lead-silver-zinc properties, under option in the department of Arequipa. *Kennecott Copper Corporation* has been concentrating its exploration on several properties in central Peru. *American Smelting* and *Refining Company* has abandoned its option on the *Patillani* copper prospect in the department of Arequipa after diamond drilling it.

PUERTO RICO—Moderate quantities of magnetite have been found in several beaches of Puerto Rico by scientists of the United States Geological Survey working in cooperation with the Puerto Rico Economic Development Administration. It is considered possible that a new industry could be created by recovering iron in a magnetic process similar to that employed in other parts of the world, notably at the deposits of Misawa, Japan. On the basis of preliminary surface sampling, the five miles of dunes to the east of the mouth of the Rio de la Plata that have a width of 200 feet and a height of 30 feet, were determined to contain an average of five percent magnetite. The coastal dunes at the mouth and extending for two miles to the west of the Rio Grande de Manati are believed to contain between 10 and 20 percent magnetite. The sand comprising the island of La Marina at the mouth of the Rio Grande de Arecibo contains an estimated five percent, as do the two large dune areas between the Manati

and Arecibo rivers. Systematic drilling of the more promising areas would furnish the data necessary for an accurate estimation of reserves. Minor amounts of chromite are locally found in the sands along the west coast of the island, and small percentages of ilmenite were reported from the east coast.

COLOMBIA—*Asnazy Gold Dredging, Ltd.* reports that for the year ended December 31, 1953 6,352,590 yards were dredged to recover 12,471 ounces of fine gold. This compares with 6,761,200 yards dredged to recover 18,782 ounces in 1952. *Pato Consolidated Gold Dredging, Ltd.* reports that for the year 20,848,400 yards were dredged to recover 208,263 ounces of fine gold, compared with 19,779,300 yards dredged in 1952 to recover 161,422 ounces of fine gold.

SURINAM—Gold shipments for 1953 totalled 6,291 ounces, compared with 6,135 ounces in 1952.

BRAZIL—A French geologist, Aubert de la Rue, has reported indications of the existence of uranium in the western part of Pernambuco.

MEXICO—The reported discovery of an important deposit of high-grade selenium near Irapuato, Guanajuato, is being checked by the Mining Stimulation Commission.

CHILE—*Anaconda Copper Mining Company's* subsidiary, *Chile Exploration Company*, is reported to be seeking permission from the Chilean government to cut its output at *Chuquicamata* mine by 30 percent. This would be a reduction of about 4,100 metric tons a month from the current rate of 13,800 metric tons. A similar request has been made by the *Braden Copper Company*, a *Kennecott Copper Corporation* subsidiary. The Braden request was for a 31 percent reduction of output from *El Teniente*, or about 2,700 metric tons a month less than the present rate of 8,850 metric tons. Under Chilean law mining firms cannot lay off large numbers of employees without obtaining government permission.

BRITISH COLUMBIA — *Triumph Mines, Ltd.*, recently incorporated in British Columbia by *Triumph Mines, Inc.* of Seattle, Washington, plans geological work at the *Ayesha* and *McPhee* silver-lead-zinc properties in the Ainsworth mining district. The holdings adjoin the *Highland* mine of *Consolidated Mining and Smelting Company of Canada, Ltd.*

NEWFOUNDLAND—*St. Lawrence Corporation of Newfoundland, Ltd.* has placed its new sink-float plant in operation and it is currently handling about 2,500 tons of fluorspar ore a week on a one-shift basis. Continuing in full operation is the company's original 125-ton flotation mill which last year produced over 20,000 tons of acid-grade fluorspar. These production increases are part of the United States DMPA contract signed in 1952, which provided for advancement of up to $1,250,000 to the firm for expansion of facilities. In return the company agreed to supply 150,000 short tons of acid-grade concentrate within a four-year period. The first shipment from the new sink-float plant was delivered to Wilmington, Delaware, where the associated firm of *St. Lawrence Fluorspar Inc.* has built a 300-ton flotation mill to treat the concentrates from Newfoundland. Ore comes from the *Iron Springs* mine where the shaft is being extended from the 760- to the 1,000-foot level; the *Blue Beach* mine where a new 200-foot shaft No. 2 has been completed; and the balance from the *Lord and Lady* mine.

QUEBEC—*Quebec Copper Corporation's* new concentrator is already handling 450 to 500 tons per day; rated capacity is 800 tons daily. Ore reserves are considered sufficient to support operation of the mill for four to five years, with a grade of better than 2.0 percent copper ore. Underground development work has been completed to the bottom 1,160-foot horizon, and deeper exploratory drilling has gone to the 1,600-foot horizon. The company has already contracted to sell expected 1954 production of copper at prices prevailing in March, April, and May, in order to assure a good price for the production of the current year.

ONTARIO—*American Metal Company* of New York has acquired stock and options in the *Pacific (Eastern) Gold Mines Ltd.*, and will assume direction of the firm' exploration work in the Manitouwadge Lake area of northwestern Ontario. Already underway is a geophysical survey of the claims which adjoin *Lun-Echo Gold Mines Ltd.* J. M. Powelson of American Metal has been elected to the board of Pacific (Eastern) to represent his firm's interests.

ALASKA—*Brewis Red Lake Mines* of Ontario, Canada, tentatively plans to drive a 2,000-foot tunnel on its recently acquired lead-silver-zinc prospect nine miles east of Wrangell, Alaska, when the spring season opens. The property is north of the Unuk River claims of *Granduc Mines Ltd.*

BRITISH COLUMBIA — *Bralorne Mines, Ltd.* has extended its 20th level

QMI Seeks Yukon Water Rights for Power Project

Quebec Metallurgical Industries, Ltd., a subsidiary of Frobisher, Ltd., has made formal applications to the Canadian and British Columbian governments for water rights to some of the lakes and tributaries of the Yukon River system. QMI has been experimenting for some time with various metallurgical processes which depend upon the use of cheap waterpower. Surveys of the water potential of the Yukon area have been made during the past year with favorable results. British Columbia controls about half of the water potential and the Canadian government controls the remainder. If approved, initial plans call for development of the project stage by stage, beginning with a power plant with a 100,000-kw. capacity, expanding eventually to 4,500,000-horsepower potential. A tunnel would be driven to connect Atlin Lake and Sloko Lake; a dam at the north end of Atlin Lake would cause water to flow back through Sloko Lake to the south where the first small generating station would be built. Nearby at Tulsequah, at the head of Taku Inlet, an electrometallurgical plant would be erected. Later, a nine-mile tunnel would be driven south from Sloko Lake. It would provide a 1,000-foot water drop to where the main generating plant would be built. A shorter second tunnel offering another substantial drop to a point near the head of Taku Inlet would be the site for another station. Also needed is access to deep water, and under consideration is the deepening of the Taku Inlet through the Alaskan panhandle into Canada. However, this would require international action which is considered unfeasible by many authorities. If the hydroelectric development proceeds, power will also be made available to many other industries.

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crosscut more than 2,200 feet, which is more than half way to the downward projection of its King vein. The bore will also cut veins in ground owned by *Taylor Bridge River Mines*, in which Bralorne has a two-thirds interest.

ONTARIO — *Consolidated Ranwick Uranium Mines Ltd.* has acquired the options on *Centre Lake Uranium Mines Ltd.* held by *Charlebois Lake Uranium Ltd.* The new financing arrangement will permit Centre Lake to proceed with sinking of a shaft at its property at *Bancroft* to open initially one level 125 feet below the adit level. About 2,000 feet of lateral work will be conducted at that level. Exploration work to date has consisted of diamond drilling of the ore zone and additional investigation of it from the main adit level. The decision to develop the property further had been motivated by encouraging indications from the government at Ottawa that a price greater than the prevailing $7.25 per pound for uranium oxide could be obtained.

BRITISH COLUMBIA — *Western Nickel Mining Company*, a subsidiary of *Newmont Mining Corporation*, has completed preparatory work for driving of a raise from a point 5,600 feet from the portal of the long low-level tunnel in its Pacific Nickel mine near Choate. The 5,677-foot tunnel was driven at a horizon about 1,000 feet below the former workings. It is planned to drive the new raise half of the estimated distance to the upper level and then to establish a sub-level on which diamond drill stations will be spotted. Half of the funds necessary for development of the property are being provided by the United States Defense Materials Procurement Agency.

OCEANIA

NEW ZEALAND — *Arahura Gold Dredging N.L.* reports that during February the firm dredged 280,000 cubic yards for a recovery of 1,600 ounces of gold.

PHILIPPINE ISLANDS—A technical mission from Japan will meet with staff members of the *Philippine Iron Mines Inc.* to discuss beneficiation of the company's iron ore from its mines in Larap, Camarines Norte. The mines at Larap supply the ore for the Japanese steel mills. While in the Philippines, the mission will also discuss the scale of development of the *Mati* iron deposits to meet the requirements of the steel mills.

NEW SOUTH WALES—Rutile production in 1953 is estimated at 40,000 tons (minimum 96 percent concentrates), an all-time record, despite decreases in price that have been almost continuous since the first quarter of that year. Zircon output declined slightly to 28,000 tons (estimated), compared with 29,700 tons in 1952. These minerals, together with some monazite, are obtained from northern New South Wales and southern Queensland. Production, especially of zircon, could be stepped up considerably, but prices offer no incentive.

QUEENSLAND—Copper production was suspended at *Mount Isa Mines, Ltd.*

in mid-January because of a breakdown in equipment. Vital spare parts were flown from the United States and production of blister copper was expected to be resumed shortly. While the copper smelter is shut down, copper concentrates are being stockpiled and it is anticipated that the leeway in smelting will be made up before June. Production figures for December 1953 and January 1954 were: lead ore 50,540 tons in December, 54,910 in January; silver-lead bullion, 2,520 tons December, 3,080 January; zinc concentrates 3,369, 3,795; copper ore 46,535, 47,880; blister copper 1,765, 879 January.

TASMANIA—The value of output from *Aberfoyle Tin N.L.* at Rossarden dropped during the half-year ended December 31, 1953. From July 1 until January 16, 1954, 26,200 tons of ore were treated for 224.5 tons of first-grade tin concentrate, 19 tons of seconds, and 65 tons of slime. Wolframite concentrate amounted to 102 tons with 126 tons of residue and 5 tons of flue dust. Value was £A433,740 compared with £A576,000 in a similar period last year.

NEW GUINEA—*Bulolo Gold Dredging Ltd.* for the three-month period ended November 30, produced 16,892 fine ounces of gold from treatment of 3,318,700 cubic yards of gravel. For the year 16,901,200 cubic yards were dredged, although the company had only four dredges in operation. Before the war (1941) the company had a throughput of nearly 20,000,000 cubic yards of gravel with eight dredges in operation. In 1947 when the company resumed post-war operations only 720,000 cubic yards were dredged with eight dredges working. However, the picture is not as bright as it seems to be because gravel reserves are estimated at 67,154,000 cubic yards which at the current rate will last only about four more years.

WESTERN AUSTRALIA—The vield of *Great Boulder (Pty.) Gold Mines Ltd.* at Kalgoorlie in 1953 was much higher than in the previous year. Tons treated were 460,172 for a recovery of 106,668 ounces of gold. Development totalled 14,093 feet, and drilling 9,891 feet. Value of gold was £A1,670,878. At Wittenoom Gorge, *Australian Blue Asbestos Ltd.* produced 4,000 tons of blue asbestos in 1953. Although this represents a substantial increase in output, costs remain high and reportedly cannot compete with the price of African asbestos. Australia is importing about 16,500 tons of asbestos per year, mainly chrysotile from Canada and amosite from South Africa.

NORTHERN TERRITORY—*Orinda Gold Mining Co. N.L.* which has been inactive for several years is to exercise purchase options over the *Arcadia* and *Westward Ho* leases at Tennant Creek. *Eldorado Tennant Creek Ltd.* has had a new stamp battery in operation since October.

TASMANIA—In the quarter ended December 1, 1953, *Mount Lyell Mining and Railway Co.*, Ltd. at Queenstown milled 371,700 tons of ore for an output of 2,605 tons of blister copper containing 10,426 ounces of silver and 1,379 ounces of gold. If the company eventually introduces fluosolids roasting, leaching, and electrowinning, the blast furnace will be supplanted after more than 60 years of operation. This has particular significance at Mount Lyell where pyritic smelting was developed. At North Dundas, *Renison Associated Tin Mines N.L.* produced 14.75 tons of tin concentrate from 1,273 tons of

Homestake Milling

(*Continued from page 43*)

ferent makes. Results to date show these figures:

Crushing	1.6 kwh
Rod Milling	2.7
Ball Milling	4.7
Total	9.0

This is a reduction of 2.25 kwh per ton from power consumption prior to 1952. Crushing now does part of the work formerly done by stamps, probably between one-half and two-thirds; the 7.4 kwh used in rod and ball milling does more work than the 8.0 kwh previously used in rod, ball, and pebble milling.

Grinding rod consumption is 0.64 pound per ton or 0.24 pound per kwh.

In one unit cast iron ball consumption is 1.8 lb. per ton or 0.36 lb. per kwh.

In two units steel ball consumption is 1.17 lb. per ton or 0.25 lb. per kwh.

Labor Saving Achieved

Operating labor has been reduced 37½ per cent, with possibly a slightly greater economy in maintenance and supply work. Liner wear is still indefinite, but regular inspection indicates that the larger units will show economy about in proportion to the greater mill volume per unit of liner area.

As a final note, all design and installation work was done by Homestake employees and was scheduled in such a way as to minimize interference with operation and consequent loss of production, so that at no time was available capacity below 80 percent of full normal tonnage.

HM&S Tungsten

(*Continued from page 39*)

WO3 is scalped off. The reject from this table is sent to a filter.

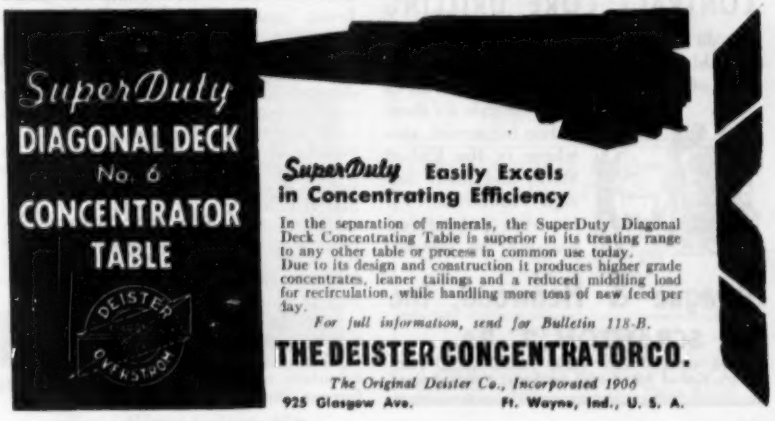
The 65 percent WO3 concentrate from the Deister table is dried by the night shift in pans placed on a butane fired stove. When treating tailing this amounts to about 100 pounds per day. Concentrate from the filter averages 10 percent WO3 and is stockpiled in the mill building until a sufficient quantity is obtained for sale to Salt Lake Tungsten who sample and assay the shipment. These assay results and tonnages are then compared with daily assay and tonnage records kept by HM&S. If the assays of the two companies differ, a third party is called in to sample and assay the shipment, payment then being made on his findings.

Why & What Reagents Used

Quebracho is added in the ball mill to depress calcite. Sodium silicate is also added here to prevent gel formation and to depress silicate minerals, and disperse siliceous and iron-oxide slimes. Alithate, a collecting agent, is added in the conditioner and the scalping cells. For a frother, detergent D40 is used, it is also added to the scalping cells.

Milling is under the direction of Jack Tallon, mill superintendent. The mill operates 24 hours a day, a flotation operator and a helper working each shift. The helper operates the scraper. On the day shift an additional man is needed to operate the Caterpillar tractor for stockpiling tailing and ore.

Electric power is received from the Utah Power and Light Company. Water is purchased from the Salt Lake City Water Department.



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For full information, send for Bulletin 118-B.

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Only selected diamonds of certain crystaline structure can be used and only specially trained and equipped setters of more than usual aptitude can be relied upon to orient diamonds correctly in the mold, but we are now fully organized for efficient production of ORIENTED DIAMOND BITS, at no additional cost to the purchaser.

In terms of footage cost, these are the most economical diamond bits ever produced and we invite inquiries on that basis. Bulletin No. 320 illustrates and describes all types and gives complete data.

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ore during December. The company has made no further report concerning the high-grade ore previously mentioned.

NEW SOUTH WALES—The dredge of *Harrietville (Tronoh) Ltd.* in three working weeks ended January 16, 1954 produced 918 ounces of gold from 1,132,900 cubic yards. At Broken Hill, *New Broken Hill Consolidated Ltd.* treated 403,600 tons of ore in the year ended December 31, 1953. Concentrates produced were: lead 44,000 tons (70 percent Pb); zinc 100,350 tons (51.5 percent Zn). The company's original program, stated in 1948, was for only 270,000 tons of ore in 1953. £Stg. 1,000,000 debenture loan has been raised in order to install equipment designed to increase ore production to 540,000 tons by 1956. Ore reserves have been stated to be at least 16,000,000 tons of higher average grade than that mined to date. In addition, leases 1,500 feet south of the *Zinc Corporation's* mine are estimated to contain 15,000,000 tons of "low grade ore."

GREECE—Exploration has disclosed large, high-grade barite deposits on the island of Myconos. Three distinct veins have been located and the estimated tonnage is around 4,000,000 metric tons. The quality of this barite is considered excellent, and extensive sampling showed an average grade of 95 percent $BaSO_4$. Reportedly, a company is being organized to develop the deposit.

AUSTRIA—The danger of avalanches during January and February hindered operation at the Donawitz steel mill of the *Alpine Montan A. G.* in Styria province, and ore mining (open pit) and transport activities from the Erzberg (ore mountain) were greatly reduced. The blast furnace operations of the steel mill at Donawitz had to be temporarily greatly reduced. After three weeks of bad weather conditions, ore production and transportation were resumed on a full scale.

FINLAND—Measures have been taken to intensify ore prospecting at Kittila in Finnish Lapland by means of modern machinery. Ore deposits would create a new future for the people of this area, where the forests are the only source of income. Ore prospecting was started by the *Atri Company* and is now being continued by the *Vuoksenniska Company.*

ITALY—A ring of smugglers were apprehended in Milan, after having shipped more than 600 tons of copper and almost three tons of iron-molybdenum behind the Iron Curtain. An additional 227 tons of copper was seized by British occupation authorities in Austria before it reached Eastern Europe. Both materials are in the "strategic" class and their export to Eastern Europe is strictly forbidden. The method had been to ship the metal directly from Great Britain or Belgium or Rotterdam to an Iron Curtain port on Italian licenses.

RUSSIA—The Ministry which has supervised the metallurgical industry has been divided into two parts and separate ministers of ferrous metals and non-ferrous metals have been appointed. Anatoly Kuzmin is Minister of Ferrous Metals and Petr Lomako is Minister of Non-Ferrous Metals. A ferrous metal industry will also be formed in the Ukraine. Russia had two separate ministries until March 1953 when they were merged under Ivan Tevosyan. It has not been indicated whether the metallurgical ministry will be abolished.

ENGLAND—The *British Malayan Tin Syndicate* is treating mine refuse dumps near Carnkie, Redruth, Cornwall, although it has restricted its attention to accumulated sand tailing dumps rather than rock dumps in the last six months or more. Another small company, *Hydraulic Tin Ltd.*, operating on an accumulation of tailing near Truro has ceased operation for the present.

YUGOSLAVIA—The government has decreed which metals, ores, and minerals may be exported during 1954, and in what quantity. The export ceilings are as follows: refined lead 50,000 tons; zinc and zinc powder 4,500 tons; rolled goods from copper and its alloys 4,000 tons; and electrolytic copper 9,000 tons. The Administration of Foreign Trade was ordered to permit exports only to these given limits. The decree went into effect on January 1, 1954.

GREECE—A group of foreign businessmen, mostly from the United States, are reported to be seriously considering development on a large scale of the well known gypsum deposits on the island of Crete. So far, no exploration has been done, and although The Netherlands does not seem to be a potential buyer any more, according to reports, these people apparently have secured a market for substantial quantities of gypsum. If the arrangements go through, it will be one of the largest investments on the mining industry of the country.

SWEDEN—The *Grangesberg Mining Company*, in negotiating 1954 iron ore prices with Germany, reduced its prices for the new season because of the decrease in European iron and steel production during 1953. Since 1952, the international iron and steel prices have dropped 30 to 40 percent, while ore prices have remained stable.

YUGOSLAVIA—A 2,700,000,000 dinar loan will be granted to the *Bor* copper mines for the sinking of at least two new shafts, and the building of a new furnace. This expansion is expected to start in 1956 and will extend the life of the mines by at least 25 years.

AUSTRIA—The zinc mill of the *Bleiberger Union* in Carinthia Province, currently under construction with the aid of United States and Austrian funds, is to start operation in the spring of 1955. The plant, located at Gailitz, now operates in other departments; 20,000 tons of sulphuric acid were produced there during the past year.

ITALY—The Italian sulphur industry has entered another period of crisis. With world demand back to normal since the end of the Korean War, Italian sulphur, whose production costs are about twice those of United States sulphur, has again priced out of the international market. As a result, Italian exports have dropped from 51,500 tons during the first 11 months of 1952 to less than 7,000 tons in the corresponding period of 1953. The government may be forced to finance inventories which are fast approaching the very large total of 250,000 tons. There are reports that more drastic measures may have to be considered,

such as the closing down of marginal mines.

EUROPE—Belgian and French iron producers are protesting the dumping of iron ore from the Soviet Union upon the Western European market. The Association of British Iron and Steel Producers ordered 100,000 metric tons of pig iron, the first shipments of which have already left Russia. While Great Britain imported 1,500,000 tons of pig iron from Austria during 1953, and additional quantities from France and the Netherlands, only a fraction is to be imported during 1954 and the Soviet Union received the first orders. Belgian importers recently ordered 200,000 to 250,000 tons of pig iron from the Soviet Union, and France has ordered a special quality of gray cast iron from the USSR at prices 24 to 25 percent below the price level charged for equal quality products stemming from the European Montan Union. The iron producers' protests have been made to the Montan Union, which is permitted to take action against these shipments.

ENGLAND—A small amount of wolframite is being produced from the *Castle-an-Dinas* mine, a subsidiary of *South Crofty* mine, and the main shaft is being sunk. Some wolframite is also being produced at *Trebartha* mine on the eastern fringe of the Bodmin Moor. It is reported that a good tin-bearing lode has been cut and is now being developed. An adjoining mine operated by the *Hawkeswood Mining Company* also produces wolframite and has been carrying out development. A small plant is now being erected. Crushing will be done with jaw crushers and rolls, followed by sizing and concentration in jigs and on tables.

YUGOSLAVIA—Steel production more than doubled the 1938 total of 232,000 metric tons when in 1952 504,000 metric tons were produced. Since all open-hearth furnaces were installed during 1953—not all of them ready for operation by the end of the year—production of 1953 is estimated at 720,000 metric tons minimum, and 860,000 tons maximum. The government expects to reach a goal of 1,000,000 tons during 1954, and has set a goal of 1,330,000 metric tons for 1956. At that time, all domestic requirements can be met and about 40,000 tons of steel released for export.

NORWAY—*Det Norske Zinkkompani* A/S will erect a phosphoric acid plant at Odda, Norway, designed by *The Dorr Company* of Stamford, Connecticut. The plant will use Moroccan phosphate rock as raw material. Sulfur dioxide from zinc concentrate roasters will be the source of sulphur for the production of H_2SO_4 used in the process.

AUSTRIA—Trade between Austria and East (Soviet) Germany is scheduled for an increase. $18,000,000 worth of goods are to be exchanged. Among the items, Austria will deliver magnesite, talcum, and caustic magnesite for $60,000, iron and steel for $5,850,000. In this latter group Austrian products consist of raw iron, commercial iron, and $4,550,000 worth of highest grade steel and aluminum. The East German republic will send $300,00 worth of ferro-alloys.

RUSSIA—The Soviet Union claims a 1953 production of 39,000,000 metric tons of steel. The overall industrial rise above 1940 is said to be 250 percent. (The production of consumer goods rose by 72 percent.)

AUSTRIA—Iron ore production reached 2,756,630 metric tons during 1953, compared with 2,652,588 tons during the previous year. This amount was divided between the *Alpine Montan A.G.'s* and the *Vereinigte Stahl Werke's* iron mills. West Germany received about 200,000 tons of iron ore. Steel production increased by 16 percent, to reach 1,281,096 metric tons. Production of magnesite exceeded the 1952 total by 8.43 percent, totalling 804,800 metric tons.

DENMARK—The Danish trade agreement with Yugoslavia has been extended for another 20 months until June 30, 1955. Among the items Denmark will export are 400 metric tons of cryolite (from Greenland) and $3,000,000 worth of machinery. In turn, Yugoslavia will send to Denmark 10 tons of quicksilver, 1,000 tons of red lead, 200 tons of zinc white, 100 tons of lithophone, 1,000 tons of calcined magnesite and refractory products, and 100 tons of antimony regulus.

ITALY—The flotation plant erected at the sulphur mine of *Cozzo Disi* in Sicily, with equipment supplied by United States firms, has started operation and is temporarily fed with residues from the steam extraction plant. Meanwhile, the new shaft and hoist, which have been planned for delivering of run-of-the-mine ore directly to the flotation plant, are now nearing completion.

Cyclones Today

(*Continued from page 47*)

nance difficulties producing mine backfill, closing primary and secondary grinding circuits, treating flotation middlings, degritting clay and milk of lime, desliming phosphate rock and copper, cobalt, zinc, silver, and lead mill tailings, and desliming pyrite concentrate.

However, as outlined, not all applications were successful at their inception. Many required prolonged development work before they were commercially acceptable and in some cases the DorrClone has been incapable of economically producing the desired results. The Dorr Company's continuing development program has been directed toward the sclution of the problems posed by variables of design, performance and materials of construction. The company's aim has always been an engineered unit, capable of controlled and predictable operation.

It is clear that within the past few years the wet cyclone has earned its place as a classification unit. Its enormous capacity-for-size, its simplicity and its relatively modest initial cost have wide appeal—and its practical advantages have been proven beyond doubt in many applications. But for all its strong points, it should not be considered a cure-all for classification problems, but rather as another valuable and useful tool for the practicing engineer. And in its use, he must be aware of its limitations.

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U.S.A. Metal & Mineral Prices

METALS

March 17, 1954

COPPER:	**Electrolytic.** Delivered F.o.b. cars, Valley basis	30.00¢
	Lake. Delivered, destinations, U.S.A.	30.00¢
	Foreign Copper. Valley basis	29.75-30.00¢
LEAD:	**Common Grade.** New York	13.00¢
ZINC:	**Tri-State Concentrates,** jig, flotation 80% lead, per ton, Eagle-Picher	$159.05
	Prime Western; F.o.b., E. St. Louis	9.75¢
	Prime Western; Delivered, New York	10.25¢
	Tri-State Concentrate, 60% zinc, per ton Joplin	58.00
ALUMINUM:	**Primary 30 Pound Ingots (90% plus).** F.o.b. shipping points	21.50¢
ANTIMONY:	**Lone Star Brand.** F.o.b. Laredo, in bulk	29.00¢
BISMUTH:	(in ton lots) price per pound	$2.25
CADMIUM:	**Sticks and bars.** 1 to 5 ton lots (Price per pound)	$1.70
COBALT:	**97-99%,** keg of 550 pounds (Price per pound)	$2.60
COLUMBIUM:	**Powder** Nom., per pound	$75.00
MAGNESIUM:	**Ingots (99.8%).** F.o.b. Freeport, Texas	27.00¢
MERCURY:	**Flasks.** Small lots, New York	$202.00-$205.00
NICKEL:	**"F" Ingots (5 pounds).** F.o.b. refinery,, Port Colbourne, Ontario	60.00¢
TIN:	**Grade A Brands.** New York (Price per pound) Prompt delivery	93.00¢
TITANIUM:	**99.3%** + (Price per pound)	$5.00
GOLD:	United States Treasury price	$35.00 per ounce
SILVER:	**Newly mined domestic.** United States Treasury price	90½¢ per ounce
	Foreign Handy & Harman	85.25¢ per ounce
PLATINUM:	**Per Ounce**	$90.00-92.00
ZIRCONIUM:	**Powder,** 100 pound lots, per pound	$7.00

ORES AND CONCENTRATES

BERYLLIUM ORE:	**10 to 12% BeO.** F.o.b. mine, Colorado	$47.00 per unit
	Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.	
CHROME ORE:	F.o.b. railroad cars eastern seaports. Long tons dry weight.	
	African (Rhodesian). 48% Cr_2O_3. 3 to 1 Ratio	$44.00-$46.00
	African (Transvaal). 48% Cr_2O_3. No Ratio	$32.00-$33.00
	Turkish. 48% Cr_2O_3. 3 to 1 chrome-iron ratio	$52.00-$54.00
	U. S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade ore and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.	
COLUMBIUM-TANTALUM ORE:	At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus.	
IRON ORE:	Lake Superior. Per gross ton Lower Lake Ports	
	Mesabi, Non Bessemer, 51.5% Fe. Second quarter	$9.90
	Mesabi, Bessemer, 51.5% Fe. Second quarter	$10.05
	Old Range Non Bessemer. Second quarter	$10.15
	Old Range Bessemer. Second quarter	$10.30
	Swedish, Atlantic Ports, 60 to 68% Fe, Contracts, Per Unit	22.00¢
MANGANESE ORE:	**Metallurgical grade.** 46 to 48% Mn. Long ton unit	$1.05-$1.07
	Chemical grade. 80% MnO_2. Per ton	$70.00
	Domestic U. S. Government are purchasing depots: Deming, New Mexico; base price $2.30 per long dry ton unit of recoverable manganese less handling and treating costs. Wenden, Arizona; base price of $8.54 per long dry ton of 15% manganese ore. Butte, Montana; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Montana base price of $6.43 per long ton unit of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40% Mn. Base price (48%) $2.30 per unit with premiums and penalties.	
MOLYBDENUM CONCENTRATE:	90% MoS_2 F.o.b. Climax, Colorado. Per pound of contained molybdenum, plus cost of containers	$1.00
TUNGSTEN CONCENTRATE:	**Domestic.** 60% WO_3 Per short ton unit	$63.00-$65.00
	Foreign. 65% WO_3 Per short ton unit (Scheelite)	$23.00
	Foreign. South American, Spanish, Portugese	$17.00-$18.00
URANIUM ORE:	**Carnotite-Roscoelite.** F.o.b. purchase depot plus $0.06 per ton mile ($6.00 maximum), Grand Junction, Rifle, Durango, Naturita and Uravan, Colorado. Salt Lake City, Marysvale, Thompsons, Moab, and Monticello, Utah. Shiprock, New Mexico, Edgemont, S. Dakota. Base price for 0.10% ore is $1.50 per pound and up to $3.50 per pound of contained U_3O_8 plus $0.75 per pound for each pound in excess of 4 pounds per short dry ton and an extra allowance of $0.25 per pound for each in excess of 10 pounds. A $0.50 per pound development allowance paid on all ores purchases. At Shiprock all ores with more than 6% lime are penalized for excess lime.	
VANADIUM ORE:	**Carnotite-Roscoelite.** V_2O_5 in ratio of more than 10 parts to 1 part of U_3O_8 are generally acceptable at all AEC depots, but excess not paid for at Marysvale, Monticello and Shiprock. Per Pound V_2O_5	$0.31

NON-METALLIC MINERALS

BENTONITE:	**Minus-200-mesh.** F.o.b. Wyoming points. Per ton in carload lots	$12.50
	Oil Well grade. Packed in 100 pound paper bags	$14.00
FLUORSPAR:	**Metallurgical grade.** 70% effective CaF_2 content per short ton F.o.b. Illinois- Kentucky mines	$42.50
	Mexican. 70% f.o.b. border	$30.00
	European, Atlantic Ports, 70%	$37.00
	Acid Grade. 97% CaF_2 F.o.b. Kentucky, Illinois, Colorado	$60.00
PERLITE:	**Crude:** F.o.b. mine per short ton	$3.00 to $5.00
	Plaster grades. Crushed and sized. F.o.b. plants	$7.00 to $9.00
SULPHUR:	Long ton, F.o.b. Hoskins Mound, Texas	$25.50
	Export	$30.50

LONDON METAL AND MINERAL PRICES

March 13, 1954

		Per Long Ton	USA Equivalent cents per pound[1]
COPPER:	**Electrolytic, spot**	£238 10s 0d	29.81¢
LEAD:	**Refined, 99.97%**	£86 15s 0d	10.84¢
ZINC:	**Virgin, 98%**	£73 5s 0d	9.16¢
ALUMINUM:	**Ingot, 99.5%**	£156 0s 0d	19.50¢
ANTIMONY:	**Regulus, 99.6%**	£210 0s 0d	26.25¢
TIN:	**Standard, 99.75%**	£754s 0s 0d	91.87¢
TUNGSTEN:	**Long ton unit, 100s, equivalent to**		$14.00

1. With Sterling pound at $2.80.

Quotations on metals and certain ores through the courtesy of *American Metal Market*, New York, N.Y.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill, or smelter. This PEP section is MINING WORLD'S way of making available to you some of the finest current information on mechanization.

Unusual Dock Construction Technique Saves 90% Labor

The DeLong Corporation's new technique of dock construction eliminates 90% of field labor in the erection of docks, wharves and piers. The DeLong steel dock can be prefabricated in shipyards anywhere in the world. Then the dock-barge, carrying its own installation gear,

is towed to site. The dock-barge is transformed into a dock in a few days, ready to berth ocean-going ships.

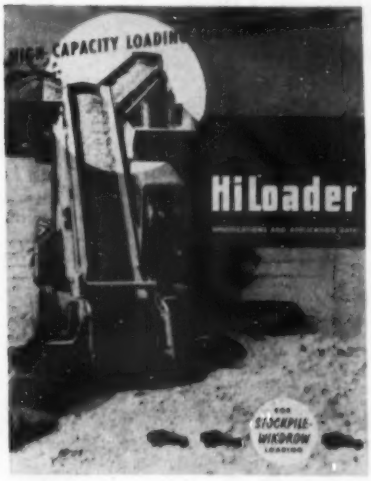
A 12-page illustrated booklet describes in detail the rapid installation of the 82-foot by 1,130-foot ore and cargo handling dock on the Orinoco River, Venezuela. Circle No. 64 for your copy.

IT'S NEW (No.) CIRCLE IT

Color Catalog Describes Force-Feed HiLoader

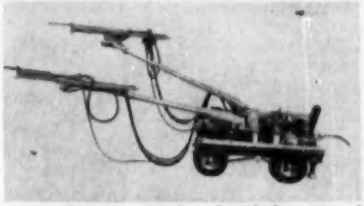
A colorful new catalog on the versatile Athey Force-Feed HiLoader is now available to equipment users. The well-illustrated, 8-page booklet shows the HiLoader on a variety of applications and details the many features that give high production. Actual job data is presented to prove HiLoader performance.

The catalog tells how the big tires, efficient power, and husky drive train give the HiLoader the traction to push steadily into piles of any loose material. And trucks find it easy to maneuver under the high discharge conveyor. Circle No. 69 for your copy of this catalog.



Self-Propelled Jumbo Has Complete Remote Controls

One operator can move into position with this Gardner-Denver JSP Mobiljumbo and drill out a complete round in a drift, room, or quarry—without leaving his seat on the jumbo carriage. Positioning of the booms and drills, as well as the complete drilling cycle, is handled by hydraulic controls conveniently grouped in front of the operator. The Mobiljumbo has been designed to reduce the time, effort, and cost required to drill in mines.



One lever on each side of the control panel raises or lowers the machine on jacks for stability while drilling. Another set of levers raises or lowers each boom independently, while other levers swing the booms laterally. Drills are positioned by hydraulic cylinders near the end of each boom, and these cylinders are also operated by levers at the control panel to move the drills through vertical and horizontal arcs. Face widths of 25 feet can be drilled from a single setting of the Mobiljumbo. Circle No. 66 for complete information.

Apron Feeder Designed For Heavy Material Handling

The Eagle Apron Feeder is designed to economically handle stone, rock, and other heavy material found in pits, mines, or quarries. It is made exceptionally heavy to withstand severe impact loads.

Interlocking steel or manganese plates are ¾-inch thick, and are riveted to heavy roller chain. The feeder is 6-foot one-inch wide and 2-foot 10-inches high. The length is variable. It is available with gear reduction drive with electric power or chain drive with clutch.

Form 853, of the Eagle Crusher Co., gives complete specifications and descriptions. Circle No. 62.

Truck-Mounted Crane Is Added To Michigan Line

A ¾ capacity truck-mounted crane has been announced by the Construction Machinery Division of the Clark Equipment Company. The ¾ cubic yard equipment,

of the "Michigan" line of excavators and cranes, will be manufactured in two truck-mounted models and one crawler model.

A completely new cab of modern design affords full visibility for the operator. An overhead window provides good visibility for long, high boom operations such as steel setting. The operator's cab is of a unit design and separate from the engine cab, thereby reducing engine noise.

The truck is available as a 6 x 4 drive or as a 6 x 6 all-wheel drive with optional power steering. A new feature is a large-capacity enclosed dunnage compartment for hooks, fall blocks, and other equipment. Circle No. 79.

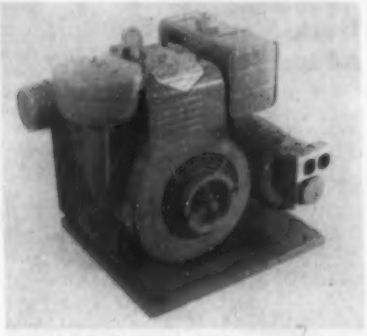
New Magnet Sweeps Clean Reclaims Valuable Scrap

A non-electric, magnetic floor sweeper is now available from the Dings Magnetic Separator Company. The new sweeper is designed to simplify the cleaning of shop floors and to reclaim valuable ferrous scrap.

The unit consists essentially of a large Alnico magnet mounted on a rubber-tired truck. It is light and easy to handle. Cleaning is accomplished simply by passing the sweeper over the littered area. The sweeper itself is easily cleaned by pulling the canvas flap over the magnet's face. Further information is available by circling No. 73.

Portable Powerhouse Has 2,000 Watt Rating

The Model B-2000 Lynnco Powerhouse has a maximum output of 2,500 watts. The Continuous rating is 2,000 watts, 115 volts, single phase, 60 cycles. Overall dimensions are only 17- by 23- by 19½-inches high. Weight is held to approximately 145 pounds complete. Power is supplied by a 5 hp. Briggs & Stratton 4-cycle, air cooled engine.



Model "B" is suitable for a wide range of usage. It will operate electric power tools, flood lights, water pumps, etc. Further information and literature about the Model "B" and the full Lynnco Powerhouse line may be obtained by circling No. 61.

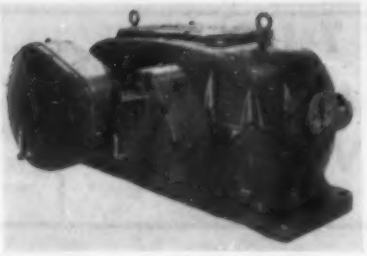
Heavy Duty Power Saw Cross Cuts and Miters

The consolidated Comet Model TC 16 Timber Cutter, introduced by Consolidated Machinery, is designed for cutting up to 16- by 16-inch timbers, both cross cutting and mitering to 45 degrees. This extra heavy duty power saw is mounted on a structural steel table frame with heavy pressed steel legs and features a built-in roller type cutting table.

It is powered with a totally enclosed fan cooled 50/60 cycle, three-phase, heavy-duty motor. Equipped with a magnetic starter, remote control station convenient to the operator, and a saw guard that takes up to 44-inch diameter blades, the new model offers quick and effortless cutting for all types of large timber. Circle No. 78.

Two New Link-Belt 25-HP. Variable Speed Drives

Link-Belt P.I.V. positive, infinitely variable speed drives are now available in two new types for 20- to 25-hp. applications. The Link-Belt Company can now supply an HG-6 drive, furnished with either a single reduction input or single reduction output helical gear attachment, or an HGG-6 drive, furnished with both a single reduction input and single reduction output helical gear attachment.



Link-Belt Folder No. 2374, just released by Link-Belt Company, provides detailed information on the size 6 P.I.V., in its three types and many ratios and assemblies. A copy will be furnished on request. Check No. 63.

Reel for Dozer Use Is Cable and Time Saver

A cable reel for dozer use, designed to eliminate wastage of large quantities of wire rope due to the wearing out of small sections, is announced by LeTourneau-Westinghouse Company, Peoria, Illinois, manufacturer of heavy construction and lifting equipment.

Called the Tournarope bantam reel, its installation on a tractor is simple. This 14-inch reel, which holds 150 feet of ⅝-inch Tournarope, is designed as a storage reel and is equipped with a bracket that can be welded or bolted on a tractor.

Before the new method was employed, an operator used approximately 65 feet of wire rope to thread his blade. Installation time was costly. When the cable broke, there was usually a 50-foot section showing no wear, but unusable because of its short length. Circle No. 71.

Lufkin Precision Level Has Ten Second Accuracy

The Master Precision Level, No. 59, has a ground and graduated vial with ten second accuracy; one division equaling .0005 of an inch per foot. The special alloy base is less affected by temperature changes and the top plate is made of special non-conductive insulating material.

The adjusting screws have 64 threads per inch for fine, positive adjustments.

The level is made from thoroughly seasoned castings and is designed to give maximum protection to the vials. The machined surfaces are scraped with extreme care. The non-machined surfaces have a durable black crackle finish. The level is 15 inches long, 3 inches high, and 1⅝ inches wide. This Lufkin level will have many applications in your machine shop. Circle No. 65.

Notes From The Manufacturers

Two major promotions have been announced by Nordberg Manufacturing Company in its Crusher, Screen, and Process Machinery Division in Milwaukee, Wisconsin. HOWARD M. ZOERB (left) has been named divisional consulting engineer and JACK B. BOND (right) is the new assistant general manager for the division. Mr. Zoerb, who has been with Nordberg for more than 30 years, formerly was administrative manager. Field contact and consultant work and application engineering will be supervised by him in his new post. Mr. Bond will continue as Division Sales Manager, a position he has held since 1951, in addition to his new job.

C. H. Rieman has been appointed Sales Manager of the Mining and Construction Divisions of the Gardner-Denver Company of Quincy, Illinois. Mr. Rieman has been with the company for 16 years. He was graduated from the University of Minnesota School of Mines in 1933.

Robert R. Carver will manage Sprague & Henwood, Inc.'s new Western Branch in Grand Junction, Colorado. The firm's main offices are in Scranton, Pennsylvania.

Charles Vignos, II, has succeeded his father as president of the American Mine Door Company, Canton, Ohio. He was elected Secretary-Treasurer of the firm's board of directors in 1949 and has been with the company since 1917. He has been on the board of directors since 1935.

Joe Hanratty, consultant for government sales at the Pioneer Engineering Works, Inc. in Minneapolis, Minnesota, has retired after 25 years of service. Mr. Hanratty is credited with conceiving idea for the Pioneer organization, a subsidiary of Poor and Company, in 1928 and with being the force behind the formation of the firm's crushing equipment division. He was honored for his service at an anniversary banquet when he retired.

DREDGE DESIGN AND SERVICE: The Bodinson Manufacturing Co. has designed and built nearly 150 dragline dredges used throughout the world. They will help you with your planning, and design and construct a dredge to give you maximum recovery at the lowest cost. They also manufacture batching plants, materials handling machinery, belt conveyor systems, bucket elevators, and power transmitting equipment. Circle No. 29 for catalog.

SEPARABLE BELT FASTENERS: The Flexco Hinged Belt Fasteners, made by Flexible Steel Lacing Co., now have removable hinge pins. Made for conveyor belts 3/8 to 1/2 inches thick, the fasteners allow the belt to trough naturally and operate smoothly through take-up pulleys. They are especially adaptable for joining underground extension conveyors. Bulletin HF 500 gives complete information on the fasteners. Circle No. 30.

LOW-COST pH METER: By taking advantage of the most recent advances in electronic tubes and circuits, Photovolt Corp. can now offer a line-operated pH meter for $115.00. The meter is simple in operation and maintenance and has remarkable accuracy. It is fully stabilized for a wide range of line voltage fluctuations. Bulletin No. 225 will give you all the information you'll want. Circle No. 31.

SIMPLEST SAND PUMP: The Vacseal pump requires no sealing water and features simplicity of design. It will handle abrasive mining pulps non-stop for 24 hours a day without leakage and without trouble. Descriptive booklet G. M. 505 gives full information. You will want to know all about Vacseal pumps, so circle No. 33 right now.

QUICK-OPENING SHEAVE BLOCKS: Pacific sheave blocks are equipped with a chained toggle pin for quick-opening. It is practically impossible for the cable to cut through the manganese steel side frames that work-harden with use. Bulletin No. 238 gives specifications on the complete line of sheave blocks. Circle No. 35 for your copy.

IMPROVED CRUSHER PERFORMANCE: Superior Gyratory Crushers offer improved performance as a direct result of their many design advantages. Advantages such as the short mainshaft, improvements in the shape and size of the crushing chamber, weight distribution. dust protection and lubrication mean more profitable crushing. Allis-Chalmers Bulletin 07B7870 gives the facts on primary and secondary crushers. Circle No. 36.

ORE BINS FOR QUICK SHIPMENT: Columbian Steel Tank Co. will handle your order for ore bins, agitators, thickeners, solution tanks, etc. in record time. They will be specially constructed for shipment by airplane or mule-back if you want them delivered that way. Complete facts on their products and services are available. Circle No. 37.

REDUCE FROTHER CONSUMPTION: In many mills today, Dowfroth 250 is producing improved metallurgy with as little as one-fourth the consumption of previous frothers used. Prove in your own mill how easy, economical, and efficient Dowfroth 250 is to use. For a test sample of this dependable frother, circle No. 39.

WIRE ROPE CUTTERS: These shear-type tools for cutting steel cable and wire rope have proved effective for all cable including ACSR. soft and hard rope, stranded guy wire, and improved plow steel up to Brinell 400 or Rockwell C 42 hardness. The #1 TN cutter cuts cable through 3/8-inch and the #3 TN cuts cable through 7/8-inch. The cutters are made by H. K. Porter, Inc. Circle No. 42 for detailed information.

COMPLETE FLOTATION SUMMARY: A 31-page Bulletin (No. F10-B81) just issued by the Denver Equipment Co. gives a complete, yet brief summary on flotation. It starts out by defining flotation and ends with the results of Denver "Sub-A" flotation at several properties. Don't miss out on this one. Circle No. 44.

BRITISH ROOF BOLT EQUIPMENT: Consolidated Pneumatic Tool Co., Ltd. of London has developed specialized roof bolting equipment for British mines. Bulletin SP 383 illustrates and describes the full line. Circle No. 18 for your copy.

LIFE LINE-A INDUCTION MOTORS offer users longer motor life, greater flexibility in application, and higher reliability. Made by Westinghouse Electric Corp., the new motors have improved ventilation, better insulation, a better protected bearing, and in addition are quieter and smaller per horsepower. For complete information on these induction motors, circle No. 19.

BE A CONVEYOR EXPERT: The Barber-Greene "Redi-Fab" Catalog will provide you with all the information, tables, etc. necessary to actually lay out a conveyor installation. The many illustrations show every phase of erection and operation of the "Redi-Fab" conveyors. Circle No. 20 for your copy.

STATIONARY DIESEL ENGINES: Five models of Lister stationary Diesel engines are described in an 8-page illustrated Bulletin (No. 5303) by the National Supply Co. Design features, specifications, and dimensional diagrams of the engines are included. Circle No. 21.

CEMENT RESISTS ACID & OIL: "Pennsalt Furan Cement" is highly resistant to acids, alkalines, and most solvents. In addition, tests have established its superior physical strength and longer working life. Pennsalt Chemicals will send you further information on this new type cement mortar if you will circle No. 5.

PLASTIC PIPE IS PRESSURE-RATED: Yardley Plastics Co. has introduced "Pressurated" plastic pipe. The pipe has pressure ratings of 75-lbs., 100-lbs., and 125-lbs. Each pipe is guaranteed to withstand the working pressure at which it is rated. Sizes from 1/2-inch to 2-inches are available in each of the three ratings. Circle No. 6.

GUAR SEED COLLOID: JAGUAR is a natural colloid derived from guar seeds. It is being successfully used by flotation and wet mineral dressing operators as a conditioning reagent, depressant, and flocculant. JAGUAR is very easy to use, and is extremely efficient and economical per unit cost. Free testing samples and a descriptive booklet are available. Just circle No. 7.

WEATHER-PROOF YOUR "CATSKINNER": Campbell Detachable Cab Co. has announced its new line of streamlined operators' cabs for most standard makes of crawler and wheel-type tractors. These cabs feature strong, lightweight construction with safety glass all-around for maximum visibility and safety. Ample room is allowed for the operator, and the sliding side windows permit full ventilation when desired. Circle No. 8 for further information.

SWECO SUCCESS STORY: One company obtained 98 percent efficiency between minus-10 and minus-60 silica sand aggregate with SWECO Vibrating Screen Units. The Southwest Engineering Co. will send you a copy of Data File 103-11 describing this successful screening operation. Circle No. 1.

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to get further information on any item described in the Production Equipment Preview, note the key number of that item, circle the corresponding number on the PEP card at the right, and mail. If mailed from a point outside the United States, proper postage must be used.

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WOOD TANKS AND PIPE: Pacific Wood Tank Corp. offers all types and sizes of wood tanks, cooling towers, pipe, and zinc boxes. Catalog No. 48 lists all these products. Circle No. 3.

CORE BARREL HAS BLOCK DETECT R: The Longyear Wire Line Core Barrel is equipped with a ball-bearing, swivel type head and optional, if desired, with a water shut-off valve. The instant a core block occurs in the bit or inner tube, the water shut-off valve action prevents the circulation of fluid, alerts the operator, and forces him to "pull" before core grinding starts. This results in vastly improved core recovery and longer bit life. Circle No. 4.

COMFORTABLE SAFETY SHOES: Bone-Dry Safety Shoes have smooth, continuous leather linings and plain toe patterns to eliminate seams at the critical point of bend. In addition, Bone-Dry gives you extra safety with waterproof, oil-tanned uppers and sure-footed, nonskid soles and heels. Circle No. 9 for a pamphlet describing the various styles of shoes available.

REPLACEMENT CHAIN CATALOG: Kensington Steel Co. has released a catalog covering its line of Kenkrome replacement chains. The 12-page catalog, Bulletin 1053, lists the bar, 700 and 800 pintle, miscellaneous pintle, rivetless, bar link, detachable link, combination, and the drag and roller types of chains. Circle No. 10.

SCINTILLATOR IS FAST COUNTER: The Royal Scintillator has a very large crystal and a fast counting circuit which result in an exceptionally high counting rate. It is both a scaler and ratemeter, and employs a scintillation counter as its detecting element. The Royal, made by Precision Radiation Instruments, Inc., is ideally suited for uranium exploration by surface or airborne methods. For complete, detailed information, circle No. 11.

PORTABLE LIFTING CRANE: The Lima lifting crane, available on crawler or wheel mounts, is made by the Construction Equipment Division of Baldwin-Lima-Hamilton Corp. The unit has a lifting capacity of 50 tons at a 12-foot radius with a 50-foot boom and 1,995 pounds at 110-foot radius with a 130-foot boom. Circle No. 12.

RUBBER MOUNTED BEARING UNITS: Sealmaster rubber mounted ball bearing units are made in six shaft sizes ranging from ½- to 1-inch. They are available as pillow blocks, flange units, and cartridge units. The synthetic rubber mounting rings are oil and grease resistant and the bearings are lubricated for life at the factory. Housings are designed for maximum rigidity and can be easily mounted with only two bolts. Stephens-Adamson Mfg. Co. will gladly send you complete information on these bearings if you circle No. 13.

FLOWSHEET FOR COPPER: Copper is the subject of a flowsheet study, M7-F27, published recently by Denver Equipment Co. The flowsheet, readily adaptable for the treatment of other ores, incorporates the latest developments in modern milling practice. It illustrates crushing, grinding, and conditioning of the ore for the flotation circuit. Circle No. 14 for your copy.

TRANSFORMER BOOKLET: Westinghouse Electric Corp.'s Booklet B-6134 tells all about large distribution transformers. It discusses how low losses are made possible by use of Hipersil Cruciform cores. You will learn how oil life is prolonged and shock and corrosion resistance is increased by use of sealed steel tanks with I-beam bases and a triple coat of "flowed-on" paint. For a copy of this booklet, circle No. 16.

CHEMICAL PUMP DATA: The Roy E. Roth Co. has announced the publication of a 24-page brochure dealing with the special designs of regenerative turbine pumps available for chemical service. The booklet contains an original approach to NPSH (Net Positive Suction Head), together with full data on the use of this concept in selecting turbine pumps for chemical service. Circle No. 17.

QUIK-LIFT HOISTS SAVE TIME: A six-page, two-color bulletin on Coffing Quik-Lift Electric Hoists has cut-away drawings showing construction details and complete specifications. All 17 Quik-Lift models from 500- to 4,000-lb. capacities are described. Circle No. 22.

"PERMANENT MAGNET" SEPARATORS: A new type of magnetic separator for the mining industry has been developed by A. S. Thunes Mek. Vaerksted in Oslo, Norway. The system is based on the use of a permanent magnet and the equipment is quite independent of electric current. It is being used for dressing and extracting iron ore by either the wet or dry processes and for the removal of unwanted ferrous content from other ores. Circle No. 46 for further information.

HOW TO INSTALL A DOCK: The De-Long Corp. tells and illustrates in a new booklet how docks can be prefabricated in shipyards, towed to site, and transformed into a dock in a few days. You will learn how the huge steel caissons are driven into a firm bearing and the superstructure jacked to the desired elevation. Circle No. 23 for a copy of this informative booklet.

A-C GENERAL LINE CATALOG: The complete line of Allis-Chalmers Mfg. Co. industrial equipment is pictorially described in the newly revised general catalog. Expanded to 36 pages, the catalog includes illustrated information and data to help you select the right machine for any job. Circle No. 24.

POSITIVE POWER TRANSMISSION: The medium duty rear mounted power control unit, Model 261, gives positive and unfailing power transmission from one gear to another. Made by Gar Wood Industries, Inc., it is designed for dependable, economical dozer or scraper work with tractors between 40 and 130 horsepower. The drum has a capacity of 268 feet of ½-inch cable. Circle No. 25.

ECONOMY IN WELDING: The Arc-Welding Division of Ampco Metal, Inc. has just released a Bulletin W-25 as a guide to economy for metal products. It points out that through the proper maintenance and repair, prolonged life and increased quality may be obtained very economically. Circle No. 26.

COLORS DISTINGUISH CREWS: Men in each department of your mine can be easily identified by separate colored hard hats. Bullard Fiberglass HARD-BOILED Safety Hats offer unlimited color choice. The colors are molded-in and are permanent. Circle No. 32.

RHINO BLADE FOR SCRAPERS: The Shunk Manufacturing Co. has announced the development of a special alloy steel cutting edge for scrapers, bulldozers, etc. The blade is precision-machined and rolled to exact specifications. It is called the Rhino Blade because of its rugged construction, and is available in all popular sizes. Circle No. 28.

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Homestake Tonnage Up; Developing Deep Levels

During 1953 the Homestake Mining Company was able to increase ore production to 1,368,059 tons as an adequate number of skilled miners were available and a change in stoping methods made possible a more rapid ore extraction. Gold recovery was 0.38 ounce per tin. Comparable 1952 figures are 1,209,884 tons of 0.39 ounce ore. Gold recovery was 96.66 percent. Installation of new grinding units was completed in the mill. Their performance is reported as better than estimated.

An increased scale of development pointed toward developing the mine below the 5,000 foot level, is under way. The Yates and Ross shafts are being deepened and preparations for a new interior shaft are being made. It is estimated that it will take two years to develop this lower area. All drilling in the mine is now done with light-weight air-leg drills, and the high-pressure compressed air locomotives are being replaced with electrical locomotives.

To the northwest of the Black Hills (South Dakota) the company discovered and mined two uranium deposits. One of these has already yielded a return in excess of total uranium exploration costs in the area. While the ore bodies have limited life, exploration for others in the area is being continued.

Donald H. McLaughlin is company president; A. H. Shoemaker, general manager; C. N. Kravig, mine superintendent; and Nathaniel Herz, chief metallurgist.

AEC Reveals Bonus Totals Awarded Uranium Miners

Uranium miners on the Colorado Plateau have received more than $3,000,000 in bonuses since the U. S. Atomic Energy Commission began its bonus program three years ago to encourage location of new deposits and defray initial production costs.

Payments are being made at the rate of approximately $175,000 per month, according to Sheldon P. Wimpfen, manager of the AEC Operations Office in Grand Junction, Colorado. Double base price is being given new mine operators for the first 10,000 pounds of contained uranium oxide produced and sold. Individual bonuses range from $15,000 to $35,000, depending on grade of the ore.

A total of 1,899 individual payments have been made to the 388 properties which have been certified so far. The program is scheduled to run through February 1957.

Utah Uranium Miners Plan Miners' Protective Assoc.

Reports of claim jumping in the Moab, Utah area have become so serious that a "Miner's Protective Association" was formed by local miners at a mass meeting on March 5th at the Grand County Court House.

The group, headed by prominent and long-time uranium prospectors and mine operators, said that "a strong organization is needed to protect the uranium miner or prospector, big or little, from the claim jumper, who would exploit the riches discovered by another, in a steal that might be allowed by technicalities in the law."

Citizens of Moab have been up in arms about jumping and Robert Mohler is reported to have given the following advice: "A lot of you people in Moab and vicinity have been in the uranium business a long time. The future is bright; don't throw it away to the small group of fly-by-nighters and shysters."

Operation is beginning on two new groups of uranium claims in the Mineral Canyon area of Utah. The channel outcrop is reported to be extremely rich and a 12-foot face shows assays from 0.5 to 3.0 percent U_3O_8 and 5 to 10 percent V_2O_5. The *Dragonfly* group of claims will be operated by C. Smith and Kenneth Allred, while operations of the *Rocket Jr.* group will be divided between Wilder and Brinton and William, Gail and Bill Tibbetts.

Crusher workers at the Storke Level of the *Climax Molybdenum Company*, Climax, Colorado have broken their own record by handling 13,350 tons of ore in a single eight-hour shift in February. Twelve days before this the swing shift crew had handled 12,376, which temporarily set a new high for the plant.

Shut-down of *Telluride Mines, Inc.*, Telluride, Colorado, was announced late in February by John S. Wise, general manager. The mine had faced closing in April 1953 but at the last minute was purchased by the *Idarado Mining Company* and work was resumed. This year's curtailment of operations came as a result of low lead and zinc prices. A limited crew is being retained for development purposes.

The *Hunt Oil Company* of Dallas, Texas has taken a lease on 260 uranium claims held by John Hoyman and George McCall of Telluride, Colorado, Mike Wilmoth, Ernie Blair, and Ed Kraus of Egnar, Colorado. The claims are located on the west end of Disappointment Creek in San Miguel County, Colorado. About $300,000 is tentatively planned for diamond drilling.

Sodak Mining Company has a crew stripping its property seven miles west of Belle Fourche, South Dakota. Activity is centered on the Alex King ranch and Enrico Bonato properties. The firm is also reported to be considering the findings it has made on property north and south of Devils Tower in Wyoming, and may lease the area if it is considered worthwhile.

Operations at the *Wellington* lead-zinc mine in Breckenridge, Colorado will continue at the same pace as during 1953, despite the current decline in metal prices according to W. L. Davenport, lessee of the property. Economy measures responsible for continuation of operations include recent mine improvements, 10 percent price reduction paid on contracts, $1.00 per day wage cuts, and high production records for each man shift, Davenport said. During 1953 a production of 1.3 dry tons of ore per men each shift worked at the mine was maintained.

A drilling program on the school section at La Sal Junction, Utah will soon be started by the *Atlas Uranium Corporation*.

Low bidder on a United States Atomic Energy Commission contract for about

Removing Salt from the Great Salt Lake

The great Salt Lake in Utah provides an almost inexhaustible source for salt, but unlike salt that is pumped from wells or mined, this salt often contains impurities. To assure clean salt, the Deseret Salt Company removes the impurities at its plant shown above. (The piles in the left foreground are actually salt.) The salt is crystallized from lake brine; then conveyed to the plant. Wash water is pumped vertically through salt layers floating off the impurities. The washed salt is then dewatered by an Eagle 84-inch by 25-foot double screw coarse material washer equipped with a trash remover. Another salt producer in Kansas is using a similar method because Deseret's operation proved so successful.

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ROCKY MOUNTAIN

35,000 feet of diamond drilling was the *Minerals Engineering Company* of Grand Junction, Colorado. The area to be drilled lays between the Green and Colorado Rivers in Grand and San Juan counties.

Lucien Cullen of Houston, Texas is reported to be one of the group of investors who recently purchased the *Big Buck* claims adjoining the *Mi Vida* claims nine miles south of La Sal, Utah. The Mi Vida claims were staked by Charles A. Steen and incorporated by him into the *Utex Mining Company*. A new firm, *Standard Uranium Company*, has been formed to operate the Big Buck. (See MINING WORLD, February 1954, page 87)

Western Phosphates, Inc. has begun full-scale production at its phosphate fertilizer plant near Garfield, Utah. The $5,000,000 plant has an initial capacity of 92,000 tons per year. Western Phosphates is owned by *Kennecott Copper Corporation, American Smelting and Refining Company*, and *Stauffer Chemical Company*.

Hamil Silver Lead Mines, Ltd. of British Columbia has leased uranium claims in Utah. A shipment of 14,050 pounds of development ore to *Vitro Chemical Company*, Salt Lake City, assayed 0.31 per cent uranium oxide.

Vitro Chemical Company has completed installation of a $50,000 Cottrell electrostatic dust precipitator at its uranium processing plant in Salt Lake City, Utah.

The *Lisbon Uranium Corporation* has been formed by Herbert Landes, Eric Ryberg, Max Lewis, and E. W. Dumke, Jr., all of Salt Lake City, Utah, to explore 155 acres of unpatented mining claims in the Big Indian district of San Juan County, Utah. The claims were acquired from Carolyn and J. Hawley Seely of Cisco, Charles A. Steen of Moab, and others.

Lewis Stilson is operating on his uranium claims in the Temple Mountain, Utah area with LaMar Davis of Price, Utah and Lewis Stein of Salt Lake City, Utah.

M. C. Clark of Castlegate, Utah and Sharon Johnson of Price, Utah have filed 114 uranium claims 15 north of the Delta mine on the Muddy River in Emery County, Utah.

WYOMING

The *Edgemont Mining Company* of Edgemont, South Dakota has filed location notice for 39 claims covering 780 acres in the Fremont County, Wyoming uranium area. The claims were recorded by E. J. Brockman representing the firm. The claims are located in Sections 10, 11, 14, and 15 in Township 32 North, Range 91 West, about six miles southwest of the original uranium discovery. Discovery holes have been dug and further work will wait until spring.

The *J. W. Rupert Drilling Company* of Worland, Wyoming has started drilling in the Gas Hills unit of eastern Fremont County, Wyoming where uranium was discovered last fall. The firm is operating under a United States Atomic Energy Commission contract to drill 15,000 feet of test holes.

Foley To Build Huge Taconite Plant for Erie

A general contract for construction of Erie Mining Company's multi-million dollar taconite processing plant and auxiliary buildings at Aurora has been awarded to Foley Brothers, Inc.

Amount of the contract was not disclosed, but the entire project, which includes construction of a railroad line and a Lake Superior harbor at Two Islands, will exceed $300,000,000.

One of the largest privately constructed projects under way in the United States, the Aurora plant will produce taconite pellets at the rate of 7,500,000 tons a year.

The firm is owned by Bethlehem Steel Corporation, Youngstown Sheet & Tube Company, Interlake Iron Corporation, and the Steel Company of Canada. The entire project will take several years to complete.

Mineralogists of *Kerr-McGee Industries, Inc.* are reported to have discovered deposits of ilmenite along the banks of the North Canadian River, near Woodward, Oklahoma. Phil Ferguson, Hal Cooper, and Dwight Ferguson granted Kerr-McGee the right to explore for the mineral on 30,000 acres they control along the North Canadian River. No leases have been signed and apparently the project is still in the exploratory stages.

Calumet & Hecla, Inc. invested $5,685,000 during 1953 in rehabilitation of the *Osceola Lode* copper mines on the upper peninsula of Michigan.

Geologists of *Kerr-McGee Industries, Inc.* are using a scintillometer, mounted in an airplane, in searching for uranium deposits in the radioactive lodes of Oklahoma's Wichita and Arbuckle mountains. G. R. Kennedy is head of the firm's uranium exploration department.

Total announced cuts in zinc production in the United States are now around 14,200 tons a month, at a time when consumption is reported to be at nearly an all-time high. *St. Joseph Lead Company* has reduced its slab zinc production at its Josephtown, Pennsylvania plant another 1,500 tons a month, following a previous cutback of the same amount some time ago. Altogether, St. Joseph's production at this plant has been reduced from a rate of 9,000 tons a month to 6,000 tons, or from a rate of 300 tons a day to 200 tons daily. At the *New Jersey Zinc Company* smelters at Palmerton, Pennsylvania and Depue, Illinois, slab zinc production has been curtailed by 2,000 tons a month, and the *National Zinc Company* has cut zinc output at its Bartlesville, Oklahoma plant by about 500 tons monthly. Output had previously been cut from 5,400 tons a month to 4,400 tons; the combined reductions at National Zinc, therefore, total 1,500 tons or approximately 28 percent less. *American Zinc, Lead & Smelting Company* has reduced by 450 tons monthly the tonnage produced by other smelters for its account. Total refined zinc cutbacks by American Zinc amount to 3,100 tons per month.

Effective March 5, 1954, the General Services Administration suspended all purchases of mica at the Spruce Pine, North Carolina Mica Purchasing Depot, pending reorganization of certain depot operations. Meanwhile, processing of the stock of mica already in the depot will proceed without interruption.

Carborundum Company has started full-scale operations at its new zirconium plant in Akron, Ohio at a production rate of 150,000 pounds a year. The output will go to the United States Atomic Energy Commission.

An interim expansion goal of 37,500 short tons for titanium melting facilities capacity to be reached by 1956 has been set by the Office of Defense Mobilization. The domestic industry presently has a capacity of about 7,680 tons per year. The four existing plants are planning expansion of 4,200 tons per year which will result in domestic output of at least 11,880 tons of ingot by 1956.

Expansion of facilities at the Mobile, Alabama, alumina works of *Aluminum Company of America* has been completed. Capacity of the plant, now the largest alumina plant in the United States, has been increased by 33 percent since the expansion program started in October 1951. The increased facilities will make available sufficient alumina to produce considerably over 100,000 tons of aluminum metal per year.

The United States Atomic Energy Commission's raw materials operations office in New York is conducting an airborne search for uranium deposits in two New Jersey counties—Hunterdon and Mercer—and in Bucks County, Pennsylvania. Earlier, small quantities of uranium-bearing rock were discovered near Mauch Chunk in Carbon County, Pennsylvania. A single-engine plane equipped with radiation detecting equipment flies a grid pattern while its instruments measure and record the amount of radiation projected from the ground. If the survey plane detects uranium in usable quantities, the sites will be more closely examined from the ground.

The *M. A. Hanna Coal & Ore Company* is reported to have sold its sinter mill and machinery located at the *Clifton* mines south of DeGrasse, New York to the *United States Steel Corporation*. The plant will be dismantled and shipped to the U. S. Steel plant in Cleveland, Ohio where it will be used to burn furnace flue dust.

The *Minerva Oil Company* has started construction of a 5-inch pipe line from the Saline River to its mill north of Cave-in-Rock, Illinois. The line is being built to insure a supply of water to operate the company's fluorspar mill. During the recent drought in that area, the mill was forced to close down on several occasions because of lack of water. In the past, the water supply came from run-offs into a pond and from water pumped into the pond. This has proved to be insufficient. The new line will be about 15,300 feet long.

Internationals Minerals & Chemical Corporation has established a new division—phosphate chemicals division—"to

Freeport's Sulphur Plant At Maximum Capacity

Less than three months after being placed in operation, Freeport Sulphur Company's Garden Island Bay plant near the mouth of the Mississippi River has reached its designed production rate of 500,000 long tons of sulphur per year. The $14,000,000 plant in the Louisiana marshland—costliest ever built—is the nation's newest major source of sulphur. Large building (center) is power plant which heats to 325 degrees F. more than 3,000,000 gallons of water a day for melting sulphur deep underground. In addition to the power plant and relay station, Garden Island Bay's facilities include a warehouse, maintenance shop, marine shop, floating drilling rigs, boats and barges, dock facilities, water pumping station, microwave communication system, gas meter station with 12-mile gas supply line, miles of pipe lines, waste water disposal system, office and first aid station, a dining hall and 18 four-bedroom cottages for operating and maintenance personnel. Employees work a five-day 60-hour week and then have five days off while a second group takes over.

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Block-caving method of ore mining is more profitable when "Commercial" circular steel sets are installed in mine drifts because more continuous and more uniform draw of ore reduces mining costs. Circular steel sets provide support needed to keep the drifts open and serviceable long after timber sets would fail even in heavy ground.

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provide for the continued growth of International's phosphate chemicals operations." Under the new production and sales program, International will have two phosphate divisions. The phosphate minerals division, headed by George W. Meyers, formerly head of the phosphate division, will be responsible for the mining and refining of phosphate ore in Florida and Tennessee. Under its jurisdiction are a plant near Bartow, Florida which has recently gone into operation, and plants at Wales, Tennessee, and Tupelo, Mississippi. These plants had previously been under the supervision of the phosphates division. The new phosphate chemicals division, to be headed by Howard F. Roderick, will produce phosphate and sell chemicals.

The *Zirconium Corporation* has placed its new $200,000 plant in operation at Solon, Ohio, thereby increasing the nation's zirconium production by 25 percent. A rotary kiln 64 feet long will operate on a 24-hour day, seven days a week, producing 200 pounds of zirconium oxide every 24 hours.

Substantial tonnages of iron ore, for delivery in the 1954 shipping season, have been sold by the *Cleveland-Cliffs Iron Company* to several of the large steel companies. The company's 1954 prices per gross ton, which are firm for the season, are the same as the prices in effect at the end of the 1953 season. For standard grades of iron ore of 51.50 percent natural iron, delivered at rail of vessel at lower lake ports, the prices are: Mesabi Range non-Bessemer $9.90, Mesabi Range Bessemer $10.05, Old Range non-Bessemer $10.15, Old Range Bessemer $10.30, high phos $9.90 and open hearth lump $11.15.

During 1953 *Reserve Mining Company* produced 185,243 tons of taconite pellets at its Babbitt plants as compared with a production of 12,861 tons in 1952, the first year of operation.

Sub-shaft sinking operations have been completed at the *Cary* mine operated by *Pickands Mather & Co.* at Hurley, Wisconsin. The shaft is 13 feet 2¾ inches by 11 feet ¾ inches, in cross section. Starting at the 34th level a total of 684 feet were sunk. The work was accomplished by three crews. Equipment included two buckets, a hydromucker, a clam, J-50 sinkers, and two electric hoists. The project was completed without a lost time or disabling accident.

Construction of the new crusher and conveyor at the Mahnomen No. 1 pit of *Pickands Mather & Co.* on the Cuyuna Range in Minnesota has been completed. When shipping is resumed in the spring, ore from the open pit will be crushed and conveyed to the present loading pocket located on the surface.

Iron ore handled by *M. A. Hanna Company* in 1953 amounted to a new record high of 17,835,116 tons, with five of the 33 Hanna-operated mines producing more than 1,000,000 tons each. The Hanna-operated fleet of Great Lakes vessels also set a record by carrying 4,958,965 tons of iron ore and other cargoes.

Polaris Working Rapidly On Development Projects

The three deep development projects being undertaken by Polaris Mining Company in the silver belt west of Wallace, Idaho are being rushed ahead on a six-day working week schedule.

A proposed two-mile easterly drive from the 3,000-foot level of the Silver Summit mine has been advanced more than 1,400 feet for an average of nearly 400 feet per month. The face is in ground owned by Silver Standard Mining Company. A 3,000-level bore to the west is more than halfway through ground of Chester Mining Company and is averaging 200 feet a month. A westerly drift from the 3,200 level has reached the New Purim area in which Silver Dollar Mining Company, Hayden Hill Consolidated Mining Company, and Lincoln Mining Company also have interests.

Lookout Mountain Mining and Milling Company's deep exploration project in the Pine Creek district of Shoshone County, Idaho, is nearing its objective—the downward extension of a high-grade lead vein mined on upper levels. A crosscut from the 1200-foot level of the Sunset Minerals shaft has been driven about 2,200 feet. William Penney of Kellogg is president.

Sunshine Mining Company's 3400-foot level west drift on the Yankee Girl vein in *Metropolitan Mines'* ground has reached Metropolitan's west boundary. The last 50 feet showed silver ore of good stoping width and grade. The showing is under the "87" stope mined on the 3100 level. Drifting is under way on the 3400 level to get under the No. 80 stope, an estimated 420 feet southeast of the main crosscut.

American Smelting and Refining Company has started deepening the four-compartment *Vulcan* mine shaft, west of Wallace, Idaho, 400 feet to open a new 3400 level. Diamond drilling below the 3000 level showed downward continuity of a strong silver-copper vein discovered on that level in February 1953. Sinking operations are on a three-shift, six-day-week basis. The ore body has been followed up nearly to the 2400 level, where it terminated against a fault. Development ore from this vein and from lead-silver structures previously opened on the 3000 level have kept the Zanetti mill in Lake Gulch operating on a 125 to 150-ton per day basis. Raising from the 2400 to the 2200 is starting under a plan to connect with the old 1600-foot Galena winze to improve ventilation and provide a second exit. J. E. Berg of Wallace is ASARCO's northwest manager.

Cobalt ore production is being increased from 200 to 600 tons daily at *Calera Mining Company's Blackbird* mine, Cobalt, Lemhi County, Idaho. The crew is being increased from 130 to 270 men. Operations were curtailed more than a year ago because of operating difficulties at a Utah cobalt refinery built by the parent firm, *Howe Sound Company*. The refinery's capacity is about 2,000,000 pounds of cobalt metal yearly from Blackbird mine concentrates. There is a 600-ton concentrator at the property. E. B. Douglas is manager.

Index Daley Mines Company has driven more than half of its proposed 4,200-foot lower adit at the old *Daley Consolidated* mine on the South Fork of the Boise River, near Mountain Home, Elmore County, Idaho. The tunnel will gain about 350 feet of depth below the old 440-foot Daley shaft through which previous gold-lead-zinc-copper production was taken. Equipment includes two Gardner-Denver air compressors, a Mancha electric trammer, jumbo, automatic drifters, and mechanical loaders.

Idaho Consolidated Mines, Inc. is putting finishing touches on its new 125 to 150-ton concentrator at the *Twin Peaks* mine, 20 miles south of Salmon, Lemhi County, Idaho. Equipment includes Diesel power plant, jaw-crusher, ball mill, classifier, Denver jib, and two banks of flotation cells. A compressor house and change house have been completed at the mine portal. A 315-cubic foot Worthington Diesel compressor has been installed. Values are in lead-copper-silver and gold. Charles Kapp of Salmon, who located the property, is mine-mill manager. E. G. Wilson of Seattle, Washington, is president.

After working six months to open old caved workings near the surface of the *Highland-Surprise Consolidated Mining Company* property in the Pine Creek district, Shoshone County, Idaho, a lessee found ore assaying 35 to 40 percent combined zinc-lead. He has been mining 25 tons daily. The ore was left by early-day miners because of its high zinc content. The company is mining a similar tonnage and also carrying on development of its 1450, 1650 and 1850 levels. Frank J. Luedke of Spokane, Washington, is president.

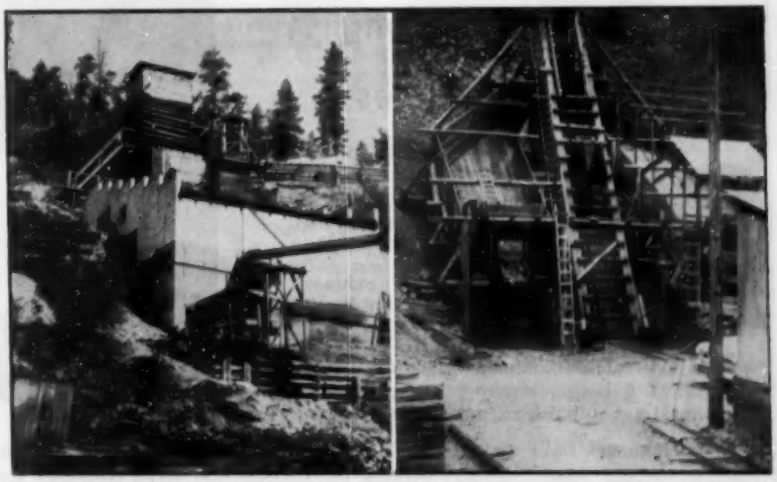
Three crews are driving a shaft raise and a chute raise at the *Vindicator Silver-Lead* property east of Mullan, Idaho, after cutting a 13 by 35-foot station for an 800-foot shaft. Gale Hansen is superintendent for the joint project of *Silver Buckle Mining Company*, Wallace, and *New Park Mining Company*, Salt Lake City.

Centrida Mines, Inc., Kellogg, Idaho, has qualified for a $31,570 DMEA loan in connection with a proposed $63,140 exploration project at the old *Pope-Shenon* copper mine near Salmon, Lemhi County, Idaho. Plans call for cross-cutting and drifting on the 600 and 500 levels, and both horizontal and downward diamond drilling.

Day Mines, Inc., is continuing full production at its *Dayrock* lead-silver property in Shoshone County, Idaho, and block-leasing at its *Tamarack* mine. At the *Hercules* mine, the main Hercules vein is being opened on the new 1600 bottom level. Retimbering of the old *Gold Hunter* mine shaft is on a one-shift basis. Exploration of both Gold Hunter ground and the easterly portion of *Independence Lead Mines* is planned from the 1200-foot vertical shaft. The *National Copper* exploration project north of Mullan has been abandoned. Henry L. Day of Wallace is company president.

Lucky Friday Silver Lead Mines Company has resumed driving of a three-compartment raise which will serve as a new mainshaft at its *Lucky Friday* mine east of Mullan, Shoshone County, Idaho. Work is being pushed on a two-shift basis, six days a week. A 400-horsepower, double-drum hoist formerly used in the *Morning* mine has been purchased from *American Smelting and Refining Company*. Ore development on the new 2300 level has been suspended temporarily in favor of the raise work. Production continues at about 125 tons daily, mostly from the 2000 level. Dave Elder is mine superintendent.

Golconda Lead Mines, between Mullan and Wallace, Idaho, has been working two shifts six days a week on its 1800



Amador Starts Copper Mining at Green Mountain

Amador Mining Company has completed deepening of the incline shaft and cutting of a new 250-foot level in its Green Mountain mine near Dixon, Montana. Work is being conducted on the South drift on the new number 4 level and the company expects to reach the ore bodies shortly if no difficulties are encountered. The photograph at left above shows the 60-ton concentrating mill, now rehabilitated, and at right are the headframe and bins of the incline shaft from which mining operations are being conducted. The firm is working under a $31,900 DMEA copper exploration contract with more than half of the work already completed. James F. Charlton is president; Merrill H. Christman is vice president.

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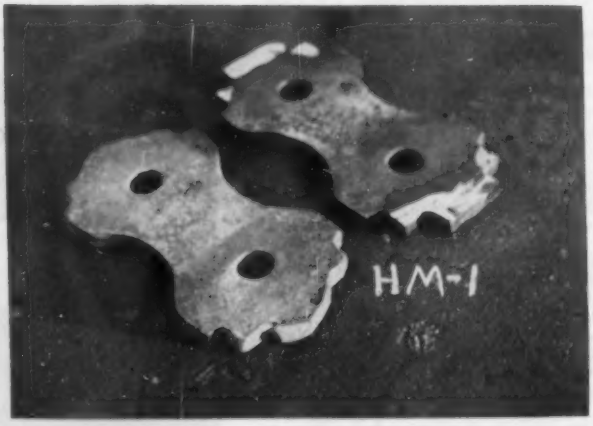

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level under a $90,000 DMEA contract. Some exploration also is underway on the 1600 level. Lessees are removing remaining ore pillars in the east ore body above the 1150 winze level. Mine production in 1953 totaled 5,410 tons. The Golconda mill treated 44,048 tons of ore on a custom basis, most of it from the Lucky Friday mine. A. H. Featherstone of Wallace is president.

Idaho Mining Company has made its shares nonassessable in a move to raise additional funds to resume exploration at its *Moon Creek* property in Shoshone County, Idaho. C. Aubrey Grissom of Salinas, California, and L. E. Beeson and Harold C. Whitehouse of Spokane, Washington have been reelected directors.

In the White Knob area near Mackay, Idaho, Earl and Fred Shirts and Swede Anderson of Hailey have leased the old *Mackey Metals* property from C. L. Hewitt of Helena, Montana, and are conducting bulldozer prospecting. Ira Lambert and Arthur Anderson are bulldozing the leased *Horseshoe* mine.

In Custer County, Idaho's Bay Horse district, *Clayton Silver Mines* is shipping about three cars of lead concentrates monthly and storing zinc concentrates pending a higher zinc price. Seven men are employed on mine production, seven in the mill and four on development. The mine shaft is being deepened for sump and pocket room preparatory to opening a new level to gain 170 feet of depth on ore bodies. The *Salmon River Electric Cooperative, Inc.* recently completed a power line to the property. Diesel generating equipment will be maintained on a standby basis.

Monterey Mining Company has been incorporated in Boise, Idaho for $300,000. Incorporators were E. R. Lindquist, of Boise, W. T. Williams of Twin Falls, and Harvey Montgomery of Hollister.

Heavy snows and a compressor breakdown forced a winter work suspension at the Lemhi County property of *Goldstone Mining Company*. The season's work had extended the new lower adit to the 1,950-foot point and mineralization indicated the face was approaching the downward extension of the Goldstone gold-copper ore body. Plans for next season include mill erection and construction of a power line from Salmon to the mine. B. W. Porter of Seattle is president and manager.

MONTANA

The *Blue Ore* group of six claims southeast of Dillon, Beaverhead County, Montana, has been taken over by *Quebec Metallurgical Industries, Ltd.*, of Ottawa, Canada, and Angus McDonald of Philipsburg, Montana. Plans include extending a 250-foot tunnel which at a depth of 150 feet disclosed a vein of good-grade manganese oxide. Thayer Lindsley of New York City is president of the Canadian firm. H. M. Kingsbury of Butte is its western Montana representative.

The old *Isele* mining claim in Butte, Montana's southwest section has been acquired under bond and lease by recently incorporated *Butte Western Mining Company*. The 300-foot shaft has

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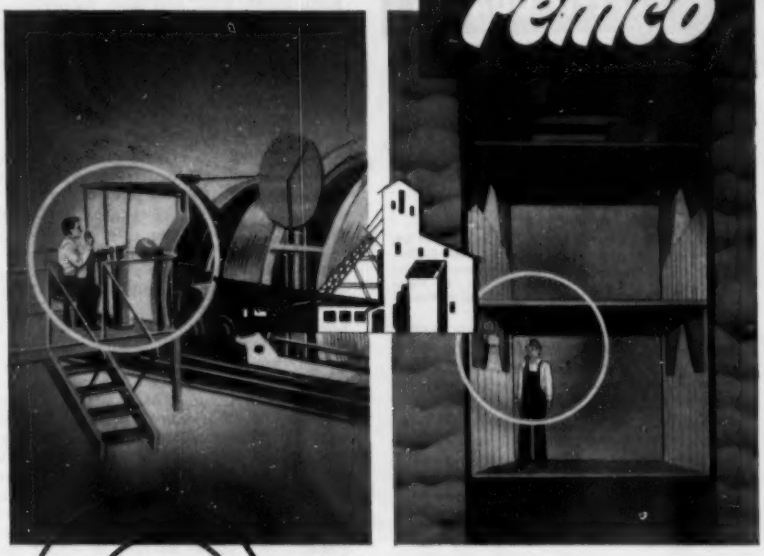

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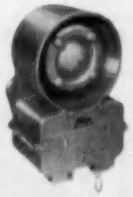

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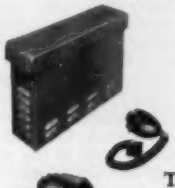

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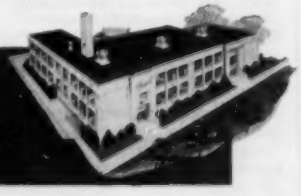

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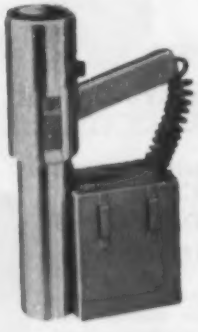

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been unwatered and workings partly cleaned out. Values are in rhodochrosite, gold, silver, lead, and zinc. Incorporators were D. O. Mecklenburg, Melvin H. Van Hess, Glenn P. Scheibing, W. P. Mefford and Harold B. Holden, all of Billings, and A. C. Fisher of Butte.

Bigger Butte Mining and Milling Company was incorporated recently by seven Butte, Montana men: Frank Benich, Ralph Seideman, Lloyd L. Thompson, Joe Craine, William J. O'Neill, Maurice J. Turner, and Frank J. Tierney.

Production goals of 1,000 tons of ore and 380 tons of 38 percent chromite concentrates daily have been reached by *American Chrome Company*, subsidiary of *The Goldfield Consolidated Mines Company*, at the *Mouat* mine, Stillwater County, Montana. This is approximately the production rate needed under an eight-year government stockpiling contract. A total of 2,400,000 tons of ore will be milled to yield 900,000 tons of concentrates. Employment totals about 300 men, half underground. The mill is operating 24 hours daily, seven days a week. Five mining levels have been established at 150-foot intervals. Long-hole mining methods are used where veins are at least six feet wide and not broken by faults or dikes. Holes up to 65 feet in length are drilled. Shrinkage stoping is used in narrower, less continuous sections. Ore is separated from waste before being hauled to a crusher at the portal. There it is reduced to four-inch maximum before being loaded into one-ton buckets for a 1½-mile tramway ride to the mill. John Bley is manager and Bill Foster, mine superintendent.

Taylor-Knapp Company at Philipsburg, Montana, has been granted an additional DMEA loan of $368,973 for deep level manganese exploration at the *True Fissure* mine. Ore was found on the 500 and 600 levels under the original DMEA contract for $156,762, which carried a $117,571 loan. The shaft now will be rehabilitated to the bottom 1200 level and lateral exploration done from there. The revised DMEA contract calls for total expenditures of $648,727. Donald Johnson is mine manager.

The old *Cleveland* mine northwest of Boulder, Jefferson County, Montana, idle for 47 years, is yielding shipping grade lead-silver ore to two Helena lessees, Harold Longmaid and John Hopkins. Shipments are to the East Helena smelter.

One of the few underground lead mines, outside the Butte district of Montana, to remain in almost continuous operation since World War II is the *Argenta* owned by John Hand. His son, William Hand, is engineer and operator of the property. The principal product is oxidized lead ore, and production varies from 50 to 100 tons per week. Generally, six to eight men are employed at the operation. The crude ore is shipped to the East Helena plant of *American Smelting and Refining Company* for treatment.

OREGON

A new group, *Placers Inc.*, is reported to have taken over claims formerly owned and operated by the Pedro Brothers on Connor Creek in southeastern Baker County, Oregon. The property includes four gulch-type placer claims known as the Huntington Placers. Coarse gold, cinnabar, and native quicksilver are reported to be present. The company plans to load gravel with a power shovel and to truck the gravel to a stationary washing plant downstream from the working face.

The John Day, Oregon, Chamber of Commerce trucked 30 tons of chrome ore from the nearby *Chambers* and *Iron King* mines to Canyon City for rail shipment to the U. S. Bureau of Mines' testing laboratory at Albany, Oregon. The properties are owned by Clint Haight, Jr.

The Defense Minerals Exploration Administration has approvde a total of 158 contracts for $10,383,696 in Idaho, Montana, Washington and Oregon. Its loan disbursements under the contracts have totaled $2,539,238. Thirty-one contracts have been completed and 14 of these have been certified as discoveries. Ore has been found at a number of other operations and they will be classed as discoveries when work is completed. Shipments have been made from 19 properties as a direct result of exploration work performed under DMEA contracts. Fifty-two contracts have been terminated or rescinded before completion.

WASHINGTON

Columbia Lead and Zinc Mining Company, operating in the Metaline district of Washington, is planning extensive diamond drilling this year. Several promising surface showings were uncovered last season. Herbert W. Carlson of Dishman has succeeded Robert P. Wallis of Spokane as president. Harold S. Johnston of Spokane was re-elected secretary-treasurer.

Howe Sound Company has started work under a $218,410 DMEA project for exploration of the downward projection of copper mineralization outcropping on Buckskin Mountain, Chelan County, Washington. Work will be done from underground workings of the firm's big *Holden* mine. Under present plans, the 1500 main haulage level will be extended about 4,000 feet and 7,000 feet of diamond drilling will be done. John J. Curzon is manager of the firm's Chelan division.

Lovitt Mining Company, Inc., operating the *Gold King* mine at Wenatchee, Washington, did 14,072 feet of drilling, 872 feet of crosscutting, 574 feet of raising, and 537 feet of drifting in 1953. Production totaled 57,689 dry tons, from which 23,136 ounces of gold and 32,242 ounces of silver were recovered. The ore had a gross value of $836,782. E. H. Lovitt of Wenatchee is president.

A. E. Kaiser, Yakima mining engineer, has leased a milling plant near Omak, Okanogan County, Washington, and rehabilitated it to handle silver ore he has been mining from the *Mohawk* claims near Conconully, which he has leased from *Sunny Peak Mining Company* of Spokane. The company is making plans to resume development of the adjoining *Gubser* group.

Eureka Corporation Sinking New Adams Hill Shaft To Mine Ore Discovered By Drilling

Eureka Corporation, Ltd. has started shaft sinking in the Adams Hill section of its gold-silver-lead-zinc properties at Eureka, Nevada. The new vertical, square, four-compartment shaft is being sunk to a depth of 1,150 feet to develop ore bodies discovered and delimited by surface rotary drilling. See MINING WORLD, August 1953, page 40. Levels will be established at 850, 950, and 1,050 foot depths. First shipment of ore, as mined, is scheduled to start in the Spring of 1955 and will probably be to plants in the Salt Lake Valley, Utah.

General manager, George W. Mitchell, has reported that two of the best drill holes, 300 feet apart, in the Adams Hill section were No. 103 and No. 106, which showed three good ore sections between 939 and 979 feet of depth in the lower section of the Hamburg dolomite. In hole No. 103 one four foot section averaged 1.1 ounces gold, 3.8 ounces silver, 24.1 percent lead, and 1.1 percent zinc per ton. Another four foot section assayed 0.30 ounce gold, 2.3 ounces silver, 16.9 percent lead, and 2.6 percent zinc per ton. A third section three feet thick assayed 0.45 ounce gold, 8.0 ounces silver, 9.6 percent lead, and 0.8 percent zinc per ton. In hole No. 106 a 15 foot core taken in a section between 853 and 910 feet in depth averaged 0.19 ounce gold, 20.8 ounces silver, 25.5 percent lead, and 1.4 percent zinc per ton. This ore horizon is much higher than the depth at which heavy inflows of water were found in the Fad shaft about a mile to the southeast. Therefore no trouble from water is expected in sinking the new shaft. However, no final assurance can be made until the shaft is sunk and mining started.

The firm is still making plans to dewater the Fad shaft and the work would necessitate extensive grouting to seal the main water bearing fissure on the 2,250 foot level. Dewatering of the shaft following grouting would have to be at the rate of at least 25,000 gallons per minute. Existing power plant facilities would permit pumping of only 6,000 to 8,000 gallons per minute. In order to reduce pumping head a survey has been made to determine the feasibility of driving a 5,000 foot long drainage tunnel to cut the Fad shaft at a depth of 475 feet. Estimated cost of this tunnel is $500,000. However, the reduced cost of pumping, and hoisting of ore would soon offset the tunnel's cost.

Estimated cost of the Adams Hill development is $750,000. Cost of dewatering the Fad shaft would be many times as great.

ARIZONA

An aerial magnetic survey and preliminary geological reconnaissance has disclosed the presence of a potentially large reserve of ilmenite 3½ miles west of Bagdad, Arizona. The *Bagdad Copper Company* is currently carrying on diamond drilling to determine the extent of the deposit. Tests carried on at the U. S. Bureau of Mines laboratory at Boulder City, Nevada indicate that the ore will produce a high-grade pig iron with a titanium-rich slag.

The *Banner Mining Company* expects to have its 400-ton concentrator in operation early in May. It is planned to make a three-mineral separation at the mill located in the Twin Buttes district south of Tucson, Arizona. A bulk copper-molybdenum concentrate will undergo selective flotation to separate these two products. Scheelite will eventually be recovered by gravity methods.

Copper Creek Consolidated Mining Company is producing copper concentrates from its new 100-ton mill which went into operation in March. Ore comes from the *Old Reliable* mine located in the Copper Creek area of Pinal County, Arizona.

Still Brothers Company, headed by Odell Still of Tombstone, Arizona, is employing a crew of six men in preliminary work at the *Great Western* mine in the Turquoise District, Cochise County. The Still lease covers 5½ claims, namely the *Mame, Highland, Humboldt, Handy, Chance*, and one-half of the *Leadville*. The Mame shaft has been opened to a depth of 150 feet, and one crew is cleaning out the old drifts and removing the blue vitreol which has been precipitated on the bottom and sides of the drifts. A second crew is engaged in dewatering the 350-foot Highland shaft. Water from this shaft is to be used in leaching the carbonate copper ores in the old mine dump. No water-tight vats or containers are employed in this phase of the work which started early in February. Instead, the sulphuric acid solutions are run down an open ditch, the flow of the solution being regulated by means of rock dams built across the open ditch at various intervals, and the copper precipitated by means of iron shavings and detinned cans. The *Hope Mining and Milling Company*, L. C. Mead, president, owns the Great Western. The Still lease is for five years with royalty payments. Martin Marcote of Lordsburg, New Mexico, is associated with Still in the venture.

The *Ray Mines Division, Kennecott Copper Corporation*, Ray, Arizona, went on a five-day work week basis March 7. According to A. P. Morris, general manager, the cut in production is the result of the decline in demand for copper. About 55 men were dropped from the payroll.

A five-day work week became effective March 8 for employes of *Inspiration Consolidated Copper Company* and *International Smelting and Refining Company*, Miami, Arizona. Union officials estimate that the take-home pay of mine workers will drop $21,000 a month as a result of the cut in working time.

H. W. Gould and Company has taken a lease on the *Chase* mine, near Prescott, Arizona, and has a small crew at work cleaning up and preparing for exploration of the property. Malcolm B. Gould of San Francisco is in charge of the operation. D. L. Nevens of Prescott is mine foreman.

The *Arrowhead Uranium Company* of Arizona has purchased a 250 Le Roi Diesel-powered compressor, to be used in conjunction with a deep-hole wagon drill for further blocking out of ore bodies.

El Oso Mines has been incorporated in Arizona for $15,000,000 by A. Virginia Rowley, Topanga, California; Olin R. Beery, Lois M. Beery, and Joseph L. Beery of Tonto Basin, Arizona; Lee Solomon, Roosevelt, Arizona; Henry L. Birckholtz,

Argentum's Ore Treated In New Flotation Mill

A new 100-ton-per-day gravity flotation mill (shown above) is in operation at Columbus Marsh, Nevada where it is treating ores from the Northern Belle mine located at Candelaria, and owned by the Argentum Mining Company of Nevada. The new mill was constructed by Argentum in cooperation with Brookside Quarries, Inc. The grinding section contains a Straub Kue-Ken jaw crusher, Telesmith Cone secondary crusher, two Hardinge conical ball mills, and two Dorr classifiers. For gravity concentration, the mill has two Deister-Overstrom concentrating tables, 6 by 16 feet. Graphite, which originally caused considerable difficulties in achieving metallurgical recoveries is easily removed in two single unit Denver "Sub-A" type flotation machines. The pulp is then conditioned in tanks; passed through four 44-inch Fagergren flotation cells acting as roughers; and then cleaned and recleaned in a battery of eight Denver "Sub-A" flotation cells. The concentrate is thickened in a Denver-type thickener and filtered in an Eimco filter before shipment. Mining operations at the Northern Belle are being carried out on the 400, 500, and 600 levels. The ore is valuable chiefly for its silver content, with some gold, lead, and zinc present. Argentum also owns the Helmes and Mt. Diablo mines.

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NEVADA

Tonopah Development Company has started stoping and shipping from its *Summit King* mine near Tonopah, Nevada. Stoping is being undertaken above the 550-foot level, the 425-foot level where a crosscut will be started from the winze, and above the 300-foot level, site of the original strike where the highest values were encountered. Officials of the firm indicate that the orebody is not as large as had first been believed, and the property reportedly may be closed down "temporarily" after removal of the known vein matter unless additional ore is discovered.

Effective March 14, the *Nevada Mines Division* of the *Kennecott Copper Corporation* will go on a five-day week operating schedule, with operations suspended on Saturdays and Sundays. A further marked decline in copper demand necessitated the reduction, say company officials. The curtailment will result in a layoff of about 210 men.

Consideration is being given to plans for construction of a large milling plant this spring at the *Atlanta* mines about 51 miles northeast of Pioche, Nevada, under option to E. C. Collins, R. A. Hardy, and S. U. Guthrie. Open-pit mining started at the famous old gold property again last August after nearly 20 years of idleness. By October two 25-ton trucks has started hauling ore to the McGill smelter for sampling. Atherly Brothers of Marysvale, Utah have the mining and hauling contract. A new road has been completed to McGill which cuts down the distance by about 42 miles. A considerable portion of the gold is found in combination with tellurium, and is considered easily amenable to roasting cyanidation.

The *Peterson Dewer* property is being worked by Fred Kundy and Joe Martinelli, both of Mina, Nevada, on two separate leases. The lead-silver ore is shipped to Selby, California and to Salt Lake City, Utah. Also known as the *Potoci* mine, it is located on the west side of Mount Washington near Candelaria.

The *Research Group* mine and mill on Columbia Marsh in Nevada has been closed for the winter. Leonard Becker-Jergons reports successful recovery of gold, silver, platinum, mercury, and antimony from the *Playa* deposits of a dry lake near Coaldale, Nevada. The operation shut down because the temperature and purity of the water used in the process directly affect the success of the operation.

Among recent DMEA contracts awarded by the government were these for Nevada operators: Caviglia and Parodi, $27,300 contract to prospect for manganese in White Pine County, government's share $20,475; *Consolidated Eureka Mining Company*, $57,050 contract to prospect for lead in Eureka County, government's share $28,525; and *Garnet Tungsten Mining Company*, $21,760 contract to prospect for tungsten in Elko County, government's share $16,320.

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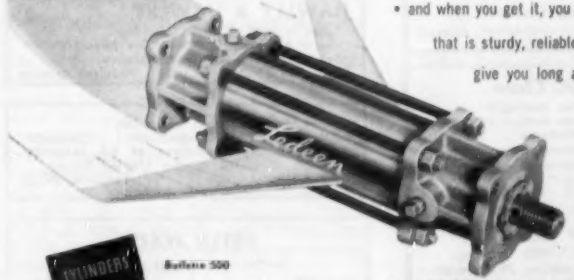

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The *Tuco Mining Company* has been incorporated in New Mexico with a capitalization of $200,000. The firm plans to undertake exploration and development work in Grant County. The company is financed by a group from Tuscon, Arizona, including Lloyd F. Harris and Elizabeth Ann Parkman. Principal place of business will be Silver City, New Mexico, with Ben Shantz acting as agent.

The DMEA has granted a $60,000 loan to Laurence Hammond of Deming, New Mexico for the exploration of manganese in Luna County, New Mexico. Mr. Hammond presently leases the *Manganese Valley* mine, located in the Little Florida Mountains near Deming, from which he has already mined and shipped some 7,000 long tons of manganese.

The *Chino Mines Division* of *Kennecott Copper Corporation* at Hurley, New Mexico has suspended Saturday and Sunday operations and is now on a five-day week. A further marked decline in the demand for copper has necessitated this reduction, say company officials. The curtailment is expected to result in the layoff of about 300 men.

New Mexico's first commercial hydrochloric acid plant is now in operation at the *International Minerals and Chemical Corporation's* potash property southeast of Carlsbad, New Mexico. The acid was formerly a waste product of the company's operations. Most of the production will go to the oil industry.

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Texas City Chemicals, Incorporated, is now operating a production unit to recover urainum concentrate as a by-product in its new phosphate products plant at Texas City, Texas. The unit was designed to recover uranium concentrates as a by-product of feed grade dicalcium phosphate and fertilizer grade dicalcium phosphate derived from Florida phosphate rock containing minor quantities of uranium. The unit is owned and operated by Texas City Chemicals, Incorporated, which has a contract to supply uranium concentrate to the United States Atomic Energy Commission. The Commission has been sponsoring research and process development studies for the recovery of uranium from domestic sources such as the very extensive phosphate deposits and reserves occurring in Florida and several Western states.

The *American Smelting and Refining Company* has curtailed slab zinc production at its Amarillo, Texas smelter by 25 percent. Only six out of eight furnaces are now in operation, reducing output by about 900 tons of zinc metal per month. The smelter has a daily capacity of 160 tons of metal. The company has also reduced operations at the slag fuming plant at El Paso, Texas by 29 percent. This was the result of cutting the work week from seven to five days, bringing a reduction of 900 tons of zinc oxide fume containing about 78 percent zinc.

S. B. Waters and associates are reported to have leased more than 800 acres of land in Llano County, Texas and have contracted for 85 core tests for uranium ore on the property. The contractor is *Diamond Corporation Inc.* of Abilene. Uranium is said to have been discovered in pilot sample holes drilled in the area.

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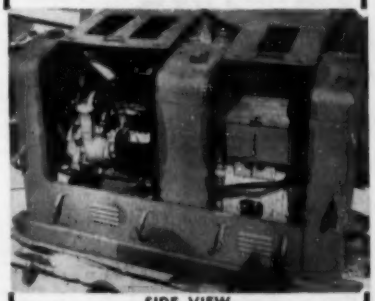

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INDEX OF ADVERTISERS IN MINING WORLD

Acker Drill Co. 62
Agence Miniere & Maritime 65
Allis-Chalmers Mfg. Co., Gen. Machinery Div. 12
Allison Steel Mfg. Co. 82
American Cyanamid Co. ... 30
American Smelting & Refining Co. 74
American Zinc, Lead & Smelting Co. 54
Anaconda Wire & Cable Co. 26
Arizona Testing Laboratories 80

Barrett, Bob 82
Basic Refractories, Inc. 82
Bemis Bro. Bag Co. 62
Black & Deason 80
Boyles Bros. Drilling Co. .. 50
Bunker Hill & Sullivan Mining & Concentrating Co. 78
Business Mon's Clearing House 83

Card Iron Works, C. S. 57
Caterpillar Tractor Co. ..... W M 25, 26 (World Mining), 25, 32
Colorado Assaying Co. 80
Columbian Steel Tank Co. .. 54
Commercial Shearing & Stamping Co. 72
Copco Pacific, Ltd. 70
Cosmopolitan Sales Co. 84

Dahl, L. H. 83
Darien Corp. 82
Deister Concentrator Co. ... 63
Denver Equipment Co. 13
Diamond Drill Contracting Co. 80
Dickinson Laboratories 80
Dings Magnetic Separator Co. 27
Dorr Co. 5
DuPont de Nemours & Co., E. I. 21

East Side Electric 82
Eastern Smelting & Refining Co. 17
Edwards Co., E. H. 24
Eimco Corp. 19
Outside Front Cover
Engineers Syndicate, Ltd. ... 76
Euclid Div. General Motors Corp. 18

Farmers Engineering & Mfg. Co. 75
Federal Pipe & Tank Co. .. 84

Galigher Co. Inside Back Cover
General Electric Company, International Div. ..... 15 (World Mining)
Goodall Brothers 80
Goodman Mfg. Co. ... W M 23 (World Mining)
Hanks, Inc., Abbott A. 80
Hardinge Co. 58
Harnischfeger Corp. 8
Hawley & Hawley 80
Hough Co., Frank G. 23

Indiana Foundry Co. 78
International Combustion, Ltd. ..... Inside Back Cover (World Mining)
International Smelting & Refining Co. 54

Jeffrey Mfg. Co. 1
Johnson, Herbert Banks 65
Joy Mfg. Co. 6

Koegel, C. P. 80
Kelly, John E. 80

Laylander, Philip A. 80
Ledeen Mfg. Co. 79
Ledoux & Co. 80
Lundberg Explorations, Ltd. 65

Mace Co. 54
Mack Motor Truck Corp. 52
Mack, Peter 80
Magma Copper Co. 78
Marion Power Shovel Co. ... 2
McClintock, R. S. 80
Meissner Engineers, Inc., John F. 65
Merrick Scale Mfg. Co. 78
Miller, Arnold H. 80
Miller Machinery Co. 82
Mine & Smelter Supply Co. 9
Morse Bros. Machinery Co. 83
Murphy, F. M. 80

National Biochemical Co. .. 82
National Malleable & Steel Castings Co. 20
Naylor Pipe Co. 60
Nordberg Mfg. Co. 4

Pacific Foundry Co., Ltd. .. 54 (World Mining)
Pacific Pipe Co. 81
Peoria, Rodgers 80
Pledger & Buck 81
Pioneer Engineering Works 10, 11
Pittsburgh Lectromelt Furnace Corp. 7
Price, Franklin L. C. 80
Precision Radiation Instruments 79

Resisto-Loy Co. 74
Ruderman Machinery Exchange 83

Salem Tool Co. 66
Scandinavian Ore Tankers, Inc. 80
Sheffield Steel Corp. .. W M 21 (World Mining)
Simplex Wire & Cable Co. 15
Sintering Machinery Co. 65, 84
Smith-Emery Co. 80
Sprague & Henwood 64
St. Clair, John Q. 80
Standard Oil Co. of Calif. .. 59
Still, Arthur R. 80
Sturtevant Mill Co. ..... W M 22 (World Mining)

Thermoid Co., Inside Front Cover
Thor Power Tool Co. ... W M 24 (World Mining)
Timken Roller Bearing Co. .. 22
Traylor Eng. & Mfg. Co. .. 4

Udy, Marvin J. 80
Union Oil Co. 31
U. S. Steel Co. 28

Van Waters & Rodgers, Inc. 80
Vulcan Iron Works 56

Wolvoord Co., O. W. 80
Wedge Wire Corp. 76, 81
Western Machinery Co. 16
Westinghouse Electric, International Inside Front Cover (World Mining)
Wilfley & Sons, A. R. Outside Back Cover
Wilfley, Clifford R. 80
Wilson, Glenn B. 83
Wolf, Harry J. 65
Wood Assaying Co., Henry E. 80

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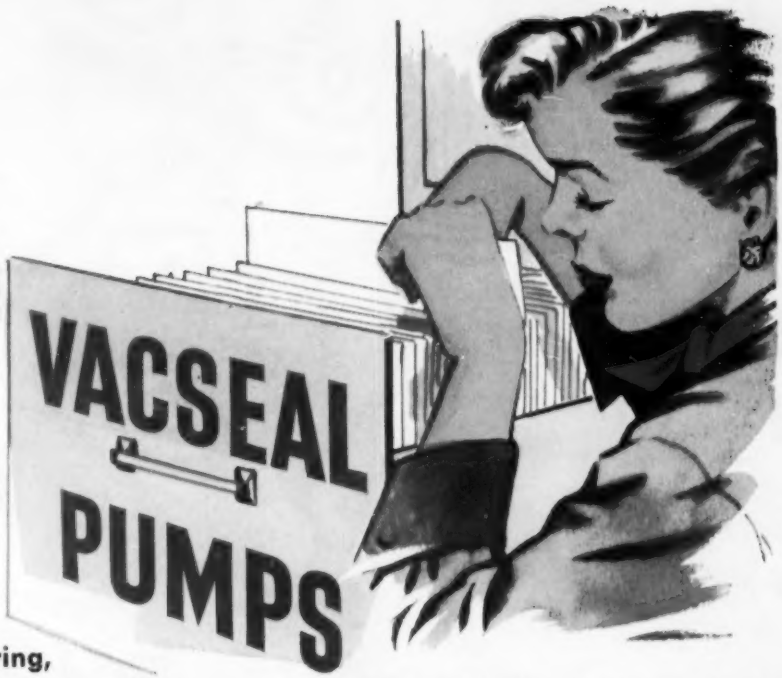

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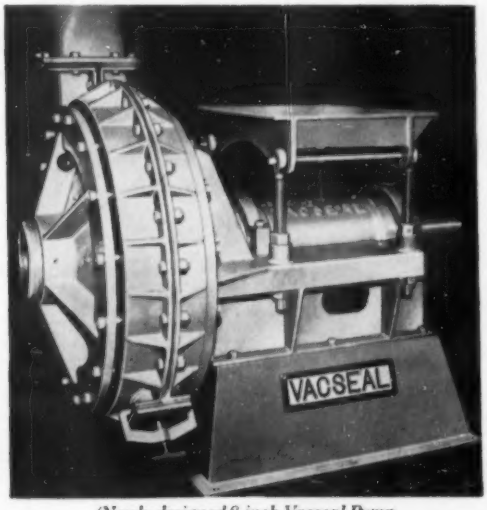

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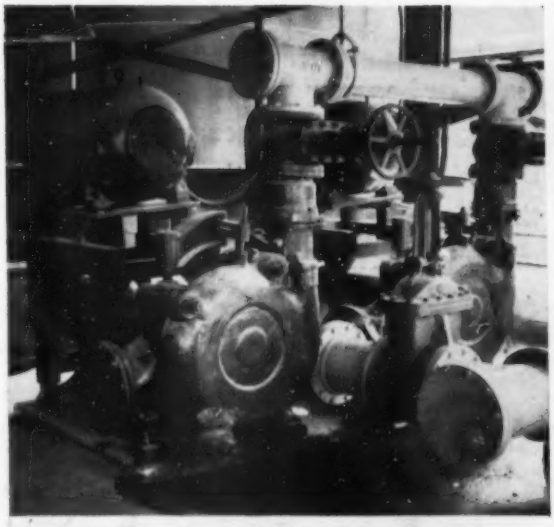

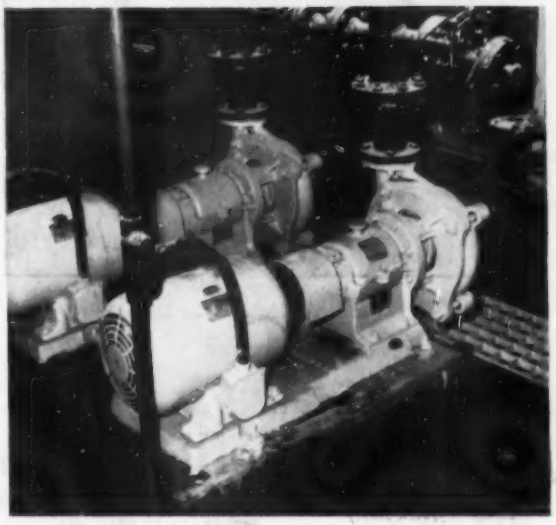

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